Medical Interns' Learning in the 21st Century

thesis submitted by

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STATEMENT OF CONTRIBUTION OF OTHERS

Nature of Assistance	Contribution	Names, Title and Affiliations of Co-Contributors
Intellectual support	Supervision	Professor Tarun Sen Gupta Professor Sarah Larkins Professor Frances Quirk Dr Rebecca Evans
	Research assistance	Dr Stephanie Moore (Townsville Hospital Intern) assisted in developing the contents of the online survey tool.
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Data collection	Interview transcription	Daphne Rodgers assisted by transcribing about half of the recorded interviews.
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ABSTRACT

Background

Historically, the Australian medical internship was "intended to be a period of apprenticeship" (Geffen, 2014, p. S20). However, the 21st Century is far more technological, with many tasks previously carried out manually now replaced with some type of automation or digital processing and medical care is not immune to this change. This raises the question of whether the 'apprenticeship' model of learning is still valid or, as Van Der Weyden suggested in a Medical Journal of Australia editorial (2006, p. 313), whether the "learning environment is less personal, …. and captive to self-directed learning".

Aims

The purpose of this study was to investigate how medical interns learn in the 21st Century and what drives interns to learn the way they do. The sub-questions were:

1. From whom or from what do interns learn and what specifically do they learn via these encounters?
2. To what degree do interns still learn via an apprenticeship model, if at all, and how much of an interns' learning is self-directed?
3. What drives interns' learning in these directions?

Methods

This study explored 'apprenticeship' learning in medicine. It utilized a concurrent mixed methods design consisting of a combination of embedded and convergent parallel mixed method study designs. Firstly, a qualitative data collection strand was embedded within a quantitative survey to allow participants to elaborate on learning experiences identified in their quantitative responses. This collective data strand was analyzed. Secondly, using a convergent parallel design, this collective strand was then merged with analyzed qualitative interview response data to allow triangulation of data and interpretation of merged results.

This study was conducted within the Townsville Hospital and Health Service which consists of a large regional hospital, four small rural hospitals and a number of small community-based units. Interns from the 2012 cohort volunteered time to the study; one intern acted as a research assistant to develop the online survey tool; 18 interns assisted in refining the online tool; 16 interns participated in a pilot study which was

conducted in Term 5 of 2012. Semi-structured interview pilots were also conducted in 2012 with the assistance of three interns and three supervisors.

Study participants included 61 interns from the 2013 and 2014 intern cohorts. Participants agreed to provide anonymous reflections on the learning they experienced whilst managing the first case of each shift in the first week of each internship term. Additionally, twenty of these interns volunteered time to be interviewed for the qualitative part of the study. Eighteen of the 2013 and 2014 supervisors of interns also agreed to be part of the study by volunteering time to be interviewed.

Results

Learning medicine is complex because human illnesses do not necessarily mirror what was described in textbooks. Interns must learn on the job, learn by doing. Medical interns' self-reported learning reflections indicated that 52.7% of their learning occurred via the apprenticeship learning relationships they had with their supervisors. The other 45.9% of their learning occurred via self-directed modes. This was as it should be in a cognitive apprenticeship where supervisors incrementally decreased their level of supervision and teaching as the intern increased their knowledge and skills towards being an independent practitioner. Interns valued the interactions they had with knowledgeable supervisors but needed to be adaptive learners to recognize and take advantage of both apprenticeship and self-directed learning opportunities if and when they arose.

Learning during the internship was iterative in that it was rarely a straight forward construction of new knowledge and skills. To further complicate learning, interns had to negotiate a number of tensions, for example service-provision versus learning, administrative processes versus opportunities for clinical/practical experiences and the desire to be independent versus the requirement to be supervised.

Proportionally more content was learnt by interns in non-core rotations (65.7%) than in core rotations (56.6%) and there was proportionally less administration (18.7%) and professional identity items (15.7%) in non-core rotations than in core rotations, (24.5% and 18.9% respectively). Interaction with supervisors was especially important for interns to learn the aspects of medicine that were difficult, if not impossible, to teach such as the tacit knowledge and skills the interns need to be accepted members of the medical fraternity.

Intern interviews indicated that their motivations to learn included a desire to be deemed competent. However, fear of failure or doing patients harm were the most common drivers of interns' learning. Interns were also striving to get in to college training programs.

Conclusion

Learning during a medical internship is multimodal. Learning occurs via a cognitive apprenticeship which consists of learning through 'apprenticeship' relationships with supervisors *and* by self-directed learning. The cognitive apprenticeship requires incremental decreases in the level of supervision with a corresponding increase in clinical responsibilities over time as the intern works towards becoming an independent practitioner. Interaction with supervisors is especially important for interns to learn the aspects of medicine that are difficult, if not impossible to teach. This includes learning the tacit knowledge and skills that enables them to be accepted members of the medical fraternity.

In time-poor learning environments, interns reported taking every advantage of apprenticeship relationships with knowledgeable supervisors; however, because service provision was often prioritized over learning, they supplemented this with self-directed learning. Interns therefore must have been adaptive learners, able to recognize learning opportunities if and when they arose.

The learning of medicine is complex and an iterative process. Interns learnt aspects of content, administration and professional identity during their internship year, however the details of what was learnt differs from rotation to rotation. It was therefore important that interns were provided a range of different clinical experiences. Interns' motivations to learn included a desire to be deemed competent, fear of doing patients harm and working towards getting in to college training programs.

Evidence collected during this study in North Queensland indicates that the current medical interns' learning environment is dominated more by the personal learning relationships they have with their supervisors (consultants and registrars) than it is by self-directed learning.

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ABBREVIATIONS

Admin	Administration
AMC	Australian Medical Council
apps	Applications
CI	Confidence Interval
CKN	Clinician's Knowledge Network
CKN – MIMS	Clinician's Knowledge Network – Monthly Index of Medical Specialties
CME	Continuing Medical Education
CPD	Continuing Professional Development
.csv	Comma-Separated Values file
ED	Emergency Department
GPs	General practitioners
HREC	Human Research Ethics Committee
JHO	Junior House Officer
ID	Infectious Diseases
IPE	Interprofessional education
IQR	Interquartile Range
LRS app	Learning Reflection Survey application
Med	Medicine
MoLIE	More Learning for Interns in Emergency
MOPS	Maintenance of Professional Standards
NZ	New Zealand
PE	Pulmonary embolism
PGMEU	Postgraduate Medical Education Unit
PGPPP	Prevocational General Practice Placements Program
PGY1	Postgraduate Year 1
PGY2	Postgraduate Year 2

PMEO	Principal Medical Education Officer
PRHO	Pre-registration House Officer
Prof Ident	Professional Identity
Qual	Qualitative
Quant	Quantitative
rCBS	Cognitive Behaviour Survey: Residency Level
RMO	Resident Medical Officer
SDL	Self-Directed Learning
Surg	Surgery
TTH	The Townsville Hospital
UK	United Kingdom
URL	Uniform Resource Locator (web address)
US	United States of America

CHAPTER 1 - INTRODUCTION

1.1 BACKGROUND

The Australian prevocational medical pathway requires that medical graduates undertake a one-year internship to gain general registration (Medical Board of Australia, 2011). Junior doctors then usually complete a further one to three years before they apply to the various colleges for specialty training (Australian College for Emergency Medicine, 2009; Royal Australasian College of Surgeons, 2011; The Royal Australian College of Physicians, 2009). However the methods by which medical interns learn during their internship has not been defined and this leaves the concept of a medical apprenticeship as the key method of junior doctors' learning open to scrutiny (AMC Competency-based Medical Education Working Group, 2010). This timely study aims to investigate learning during the medical internship and contribute to current discussions about how medical interns in Australia learn.

Historically, the Australian medical internship was "intended to be a period of apprenticeship with little formal education structure, when junior doctors progressed under supervision from "knowing" to "doing"" (Geffen, 2014, p. S20). The Oxford Dictionary (2012) defines an apprentice as "a person who is learning a trade from a skilled employer, having agreed to work for a fixed period at low wages". It can also be defined as "a beginner; a novice" (Thompson, 1995, p. 61). Apprenticeship learning involves the learner developing new schemata or mental constructs to accommodate new knowledge and understanding of a concept or task. This can occur through either formal training i.e. training that is based on a curriculum or formalized program, or non-formal training i.e. ad hoc training.

Nielsen (2010) outlined three different theoretical approaches to apprenticeships.

1. An anthropological perspective – An anthropological perspective explains how apprenticeships have a role in creating both social change and social stability within a community. Apprenticeships are a form of cooperative learning and can be viewed as a means of passing on essential knowledge and skills to maintain the social fabric of a community (Balmer, Serwint, Ruzek, & Giardino, 2008).
2. A philosophical perspective – Polanyi (1966) proposed that there are things that we know but cannot talk about; he called this tacit knowledge. A philosophical perspective recognizes the role of apprenticeships in acquiring tacit knowledge, the practical knowledge and competencies the 'apprentice' gains through observing a more experienced 'master' (Caldwell, 2011).

3. A psychological and educational perspective – This perspective is based on Bandura's (1977) theory of social learning. It includes the concept of cognitive apprenticeships which requires modeling by the 'master' followed by replication by the 'apprentice'. Classroom teaching and learning is a substantial component of this approach (Caldwell, 2011).

Cognitive apprenticeships are often used in situations where the learner can tap into the knowledge and experience of someone who has gone before them, someone who knows how to complete tasks and deal with problematic situations. It is "an instructional method for teaching an acceptable way of understanding and dealing with specific types of task, problems or problematic situations" (Brandt, Farmer, & Buckmaster, 1993, p. 70).

Brandt et al. (1993) provide details of the cognitive apprenticeship, articulating the roles of both the 'master 'and the 'apprentice' within five phases of learning.

1. Modeling - The apprentice observes the performance of the master to learn the 'tricks of the trade'.
2. Approximating - The apprentice begins to mimic the actions of the master in a safe learning environment.
3. Fading - The apprentice begins to operate with some independence, with the master still providing support but 'fading' into the background as the apprentice becomes more competent.
4. Self-directed learning - The apprentice can put the new knowledge and/or skills into action however, this is only possible within the limited context that is familiar and well-known to them.
5. Generalizing - The apprentice is able to apply their acquired knowledge and/or skills to new and unique contexts.

The most common perception of a traditional apprentice is that of a person with no qualifications or formal knowledge learning a trade. Conversely, a medical intern is not quite a beginner or a novice, having completed a minimum of four years tertiary study in a medical degree prior to starting their 'apprenticeship' as a medical intern. However, a medical internship could be seen to be similar to the traditional apprenticeship model in that it provides interns with opportunities to learn from a skilled professional, with their scope of practice being continually and collaboratively negotiated and expanded as they gain the required knowledge and skills (Chu & Hsu, 2011). A medical

apprenticeship model of learning historically involves one-on-one ‘tailored training’, where the mentor plays a pivotal role in the construction of meaningful learning within a clinical setting (Moustakas, 1994). This approach to learning most closely follows a philosophical approach to apprenticeship, where regular assessments of interns’ standards of work are checked against expected professional standards before allowing them to expand their scope of practice; learning is assured through the assessment of their practice.

It is worth noting that the landscape of prevocational medical education in Australia has changed in a number of ways since the medical internship was introduced between the 1930s and 1970s (Geffen, 2014). Firstly, there have been increasing numbers of graduates from medical schools in recent years; an 81% increase in domestic medical graduates has taken graduate numbers from 1348 in 2005 to 2442 in 2012 (Joyce, Stoelwinder, McNeil, & Piterman, 2007). This ‘tsunami’ of interns has greatly increased pressure and strain on those that supervise the ‘apprentices’ (Eley, Young, Wilkinson, Chater, & Baker, 2008; Sen Gupta, Murray, McDonell, Murphy, & Underhill, 2008; Trumble, 2011). Although there are more interns, the number of supervisors has not increased at the same rate (Australian Health Ministers' Advisory Council, 2015b). To further reduce capacity for supervision of interns, a number of consultants only work part time within the hospital system i.e. they are visiting medical officers or VMOs. This imbalance compromises the capacity for the close supervision required for apprenticeship learning to occur. More importantly, this lack of supervision can potentially lead to patient safety being compromised resulting in serious errors being made (Coombes, Stowasser, Coombes, & Mitchell, 2008; Paltridge, 2006).

Secondly, the 21st Century has become far more technological, with many manual tasks now replaced with some type of automation or digital processing. Medical care is not immune to this change. For example, there is an increased use of medical technologies to aid both the assessment and management of patients’ illnesses and even the time-honoured method of taking blood pressures is now a digital process. Many of these technological aids make medicine far more time-efficient, yet the learning required for understanding the theoretical background or knowledge of the implications of the output of these technologies is still important. Although the majority of today’s interns have grown up using more technology than previous generations, it is essential that all of them are computer literate to be able to carry out tasks such as finding patients’ details, viewing pathology and radiology results, ordering medications

and completing discharge summaries. It is not uncommon to see interns using computer programs such as UpToDate, CKN (Clinician's Knowledge Network) or 'apps' on their iPhones and iPads to aid them in diagnosing and managing patient care (Audetat et al., 2012; Kiser, 2011). The use of social media is also changing the way they learn (Carley et al., 2018).

The changed ratio of supervisors to learners and increased use of technology raises questions about whether 'apprenticeship' learning is still the predominant type of learning for interns in Australia. The Australian Medical Council (AMC) standards for assessment and accreditation of medical schools (2011) states that the required medical course outcomes are:

> *…. to develop junior doctors who possess attributes that will ensure that they are competent to practice safely and effectively under supervision as interns in Australia or New Zealand, and that they have an appropriate foundation for lifelong learning and for further training in any branch of medicine. (p. 11)*

There is no question that the aim of the internship is to further develop the skills required for lifelong learning in becoming medical 'professionals' (Commonwealth Department of Health and Ageing, 2003), however very little is actually known about the details of the methods of interns' learning in the 21st Century. Van Der Weyden (2006) highlighted the fact that there have been concerns expressed in the United Kingdom (UK) about the decline of the apprenticeship model and suggested that this was in part due to "the learning environment [being] less personal, more technology-focused and captive to self-directed learning" (p. 313).

New knowledge is now being generated at a much faster rate than in previous centuries, and it is therefore essential for doctors to continue their learning to provide the most effective patient care. If interns do rely more on self-directed learning, it will have implications for the planning of learning opportunities that enhance this process. The 2013 accreditation standards set by the AMC define a number of intern education and training requirements, including the provision of educational opportunities for them to attend 'formal' education sessions (Australian Medical Council, 2013). However, although there is a mandate on the hospitals to provide ongoing education via facility education programs, there is no mandate for the interns to participate and no consequences if they do not.

While universities and specialty colleges drive learning through examinations, there are no such incentives to drive interns to continue their learning. Medical students' learning is determined by the universities and is driven by examinations. On the other hand, interns are young professionals who are required to be responsible for their own learning. There is a transition from student to intern that is potentially accompanied by a change in the drivers of learning. This is often not an easy transition to make. College Fellows have their learning scaffolded and monitored by their colleges, but junior doctors have little support in the development of the lifelong learning behaviours they will require to become professionals. To be a lifelong learner, doctors need to be self-directed in their learning (Candy, 1991) and develop self-regulated learning skills (Sanders, 2013). However, there is little known about how well developed these skills are in interns, whether the learning currently offered aids them in developing these skills or whether some educational intervention could assist in the development of these skills.

Since this study began in 2012, there has been a review of medical intern training undertaken on behalf of the Australian Health Ministers' Advisory Council. The final report was released in September 2015 (Australian Health Ministers' Advisory Council, 2015b). The background to the review was expressed in the final report:

> *The review was commissioned against a background of increasing medical graduate numbers and some concern about the system's capacity to absorb them, particularly given the constraints of the current model. It was also considered timely to review the internship in light of the significant changes that have occurred over recent decades to the organization and practice of healthcare services as well as changes in the medical workforce and in medical education and training. (p. 10)*

The original discussion paper questioned the purpose of the medical internship and whether the existing model was valid and fit for purpose (Australian Health Ministers' Advisory Council, 2015a). The final report concluded that "the concept of a general internship remains valid", however it suggested that its fitness for purpose was questionable because of the changes that have occurred in health systems and in medical education over time (Australian Health Ministers' Advisory Council, 2015b). This thesis is contributing to the evidence base on learning in the Australian internship.

It is hoped that the data presented will inform future decisions, policy and debate re learning models for interns.

1.2 LITERATURE REVIEW

As a starting point to this study, a literature review was conducted prior to commencement to analyze what research had been carried out in relation to learning in internships and in particular, to investigate what research had been conducted that focused on:

- working versus learning; and
- the learning process in internship, both learning via the apprenticeship model and via self-directed learning.

1.2.1 METHODS

The databases Medline (via OvidSP) and PubMed 2000 – 2012 were searched for articles to identify gaps in the research prior to the commencement of this study. An additional search using the databases Scopus and ERIC 2000 – July 2018 was conducted at the end of the study to ensure current research literature was included. The 21st Century is a world shaped by science and technology that is rapidly advancing and changing things all the time. Medicine in particular has embraced technology, and this has dramatically changed not only the working environment of medical practitioners over the last decade, but also the learning environment. It is for this reason that only medical research articles in peer-reviewed journals from 2000 onwards were considered.

Although this study was principally designed to study how Australian interns learn while they work, consideration of medical graduates' learning in other countries was thought to be useful background information, and appropriate terms were therefore included in the search strategy in order to include such literature. While medical graduates in their first postgraduate year of practice in Australia are called interns, medical graduates in other countries may have other designations. For example, in the UK the first two Foundation Years of practice are prevocational years equivalent to Australia's internship years and the junior doctors training within these two years are referred to

as interns or residents. Prior to the introduction of the Foundation Years in the UK, the medical graduates undertook a year as pre-registration house officers or PRHOs. This was seen as a period that provided "an apprenticeship into [their] professional role and identity" (Bleakley, 2002, p. 10), with the PRHOs being given clear roles within the clinical teams that supported them through their practice and learning (Lemmp, Cochrane, & Rees, 2005). In America and Canada, there are no formal prevocational years of practice after graduating from medical school; medical graduates usually start training towards a specialty immediately after graduating from medical school and are normally referred to as residents.

With these global differences in the structure of junior medical officer training in mind, literature search terms included:

1. interns – intern*, prevocational doctor, pre-registration house officer, PRHO, junior doctor, residen*, postgraduate
2. learn – learn*, bedside teaching, bedside learning, self-directed learning, SDL, supervis*, mentor*, apprentice*

Advanced searches of English-language literature were completed using combinations of the search terms above. The search strategy used MeSH terms in Medline and PubMed and Keywords in Scopus and ERIC which included *"Medicine", "Medical Education", "Education", Residency Education"* and *"Internship and Residency"*, and excluded the MeSH terms or Keywords *"Medical Student", "Students, Medical"* and *"Education, Medical, Undergraduate".* An initial scan of titles and abstracts identified 5197 papers for further evaluation of relevance to the study.

Selection Parameters

The aim of the literature searches was to identify research that involved medical interns' learning within hospital clinical settings. Therefore, studies conducted within clinical hospital settings that investigated the learning of cohorts of medical interns, postgraduate year one junior doctors (PGY1), or medical residents including PRHOs in their first year of practice were included for further analysis, but only if the results for these cohorts were delineated clearly. Grey literature was not included as it is either research that has not been peer-reviewed or is not research-based work. Reference lists from the articles chosen were also checked for pertinent references that did not appear within the literature searches; these additional articles were included for further analysis in this literature review if they also satisfied the inclusion criteria.

Studies were excluded if they focused on cohorts that were not medical; a number of studies that were identified within the literature searches included veterinary interns, pharmacy interns and nurses. In order to focus this study on intern learning within hospital clinical settings, studies that reported learning in settings such as general practice or family practice and simulated learning were excluded. It should be noted that general practice was initially included as a search term for this study because a number of participating interns were allocated to general practice as part of the prevocational general practice placements program (PGPPP) in 2013 and 2014. However, the cessation of federal funding for PGPPP from 31st December 2014 onwards (Australian Government Department of Health, 2014) meant that any specific research carried out on intern placements in general practice was not going to be useful going forward for this Hospital and Health Service. Consequently, a decision was made to exclude general practice from the literature review. Additionally, clinical settings such as the Intensive Care Unit (ICU), Radiation Oncology and Telemedicine offer quite different learning experiences to ward-based rotations, however the subjects of this study were not allocated to these units. As a consequence of this, studies reporting learning within these types of clinical settings were excluded. Studies reporting the learning of specialty trainees were also excluded as these were not considered relevant to intern learning. Studies were also discounted if they concentrated on medical students rather than interns, preparedness, confidence and/or satisfaction rather than the quantity or quality of learning, transition from medical student rather than the intern experience itself or entailed educational interventions that were not in a hospital setting or were not promoting self-directed learning. Finally, articles that were non-research based such as editorials, reviews, articles for commentary or debate and literature reviews were excluded.

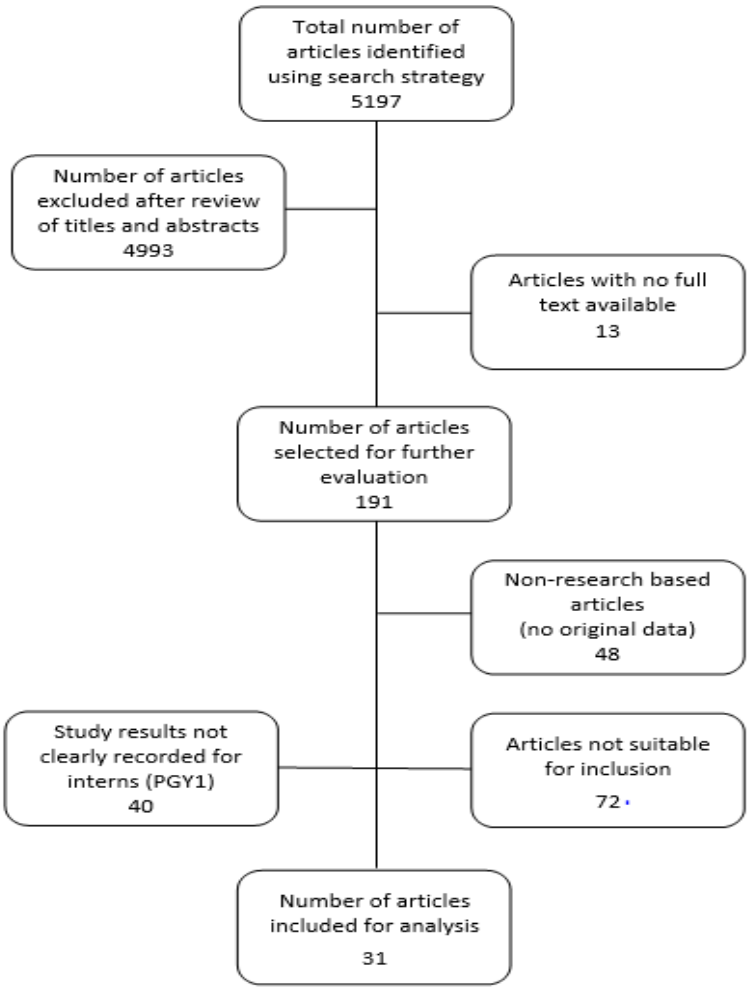
Articles selected for further analysis were uploaded to an EndNote library. Critical analyses were carried out on these remaining articles and further exclusions were made based on their relevance to the identified questions.

1.2.2 RESULTS

A flow diagram summarizing the search yield can be seen in Figure 1. After evaluation of the literature, 5197 papers were identified for initial analysis. Of these, 4993 papers were excluded after review of titles and abstracts and an additional thirteen were

excluded since no full text articles were available for download. The remaining 191 articles, consisting of 41 from Australia, 17 from the UK, 81 from the United States of America (US), 11 from New Zealand (NZ), 13 from Canada and 28 from other countries were uploaded to the EndNote library.

Figure 1: Flow diagram of search yield



Exercising the exclusion criteria outlined in Section 1.2.1 of this chapter, only thirty-one articles were considered as being relevant to the proposed area of study (Table 1). The remaining articles were not used in the final literature analysis. There is a paucity of research on interns' learning, particularly in Australia.

Table 1: Included studies

Authors	Year	Country source	Purpose of research	Method used	Subjects	Major findings
Agnew & O'Kane	2011	Aus	Develop and implement a continuing medical education (CME) points for interns	Design-based research	PGY1	• CME points system encourages interns to participate in education sessions, skills workshops, research or to present to health professionals • System provided interns with flexible learning options so that they could tailor their learning towards their preferred career pathway • System fosters self-directed and self-regulated learning behaviours
Boots et al.	2009	Aus	Investigate how medical student and intern experiences to deal with bedside procedural skills vary	Quant	Medical students, PGY1	• Interns' and students' experiences to undertake procedural skills on patients are variable • Learning needs of medical students and interns vary → training needs to be appropriate • A procedural skills training program will increase confidence
Brown et al.	2007	UK	Investigate new doctors' varying views of the first year working as a doctor: valuable professional development versus "year to be endured and survived" (p. 653)	Mixed methods	PRHO1 & educational supervisors	• New Foundation Programme has not solved all transition issues for PRHOs • First year of practice is high stakes for doctor • A period of "wise judgement under conditions of considerable uncertainty" (p. 659) • Lack of support makes doctors feel it is a post to provide service rather than to learn • PRHOs require appropriately trained educational supervisors to guide them
Chen et al.	2017	Aus	A time and motion study of interns' work to identify and quantify amount of time on work activities	Quant	PGY1	• Indirect patient care activities = 3 x direct patient care activities • Increasing clerical and administrative burden • Decreasing clinical exposure

Authors	Year	Country source	Purpose of research	Method used	Subjects	Major findings
Chung & Sprott	2008	NZ	Survey interns' assessment and management of three common urological conditions to determine if they are adequately prepared for clinical practice	Quant	PGY1	• Graduating interns are not trained adequately in the assessment and management of common urological conditions • Intern education sessions should include these topics • Guidelines should be published to aid interns' understanding of the conditions
Confederation of Postgraduate Medical Education Councils	2008	Aus	Australian Curriculum Framework for Junior Doctors	Not research	PGY1	• Outlines a learning framework for prevocational doctors in Australia • Learning is organized within three main areas; clinical management, communication and professionalism. • Each area is subdivided into three to six categories.
Dent et al.	2006	Aus	Cross-sectional cohort study to identify Australian interns' learning and training needs and describe the educational opportunities available to them	Mixed methods	PGY1, PGY2, PGY3+. IMGs	• Interns lack confidence in managing emergencies, choosing careers and dealing with medicolegal responsibilities • Registrars have an important teaching role, however, most receive little or no formal training in teaching. • Some teaching methods are not perceived as useful learning opportunities for interns and should be reviewed • Intern training programs should include more critical care skills training, procedural skills training and instruction re medicolegal issues

Authors	Year	Country source	Purpose of research	Method used	Subjects	Major findings
Derrick et al.	2006	UK	Investigate the concept of a junior doctors' training/service continuum and where various activities would be placed along this continuum	Mixed methods	PGY2+	• The higher the frequency of the task, the lower the perceived training focus in that task • Documents a comprehensive list of junior doctors' daily tasks that can be used to develop an appropriate tool to survey interns for the current study
Fletcher et al.	2012	US	A prospective time and motion study to determine the composition of intern work while they are on call	Quant	PGY1	• Not much time spent on direct patient care activities • Not much time spent on teaching/learning activities • Need to preserve time interns spend with patients • Need to increase time spent in education
Gillard et al.	2000	UK	Measure the PRHOs' training and clinical experiences since the General Medical Council's changes to work patterns and hours were implemented four years before	Quant	PRHOs	• Reduced hours of work = decline in clinical exposures to common acute medical and surgical conditions. • Reduced time spent in dedicated training
Higgins et al.	2006	UK	Explore pre-registration house officer patterns of attendance at weekly teaching sessions and consider the subsequent implications for delivering the new Foundation Programme curriculum	Quant	PRHOs	• Pressure on PRHOs to stay on wards rather than attend education can be addressed • Non-attendance due to on-call working patterns and annual leave cannot be addressed • Lack of motivation and commitment towards the education program were not evidenced as barriers to attendanceTeaching blocks prior to the start of a rotation and online learning resources can reduce the reliance on the delivery of classroom-based programs during the rotation

Authors	Year	Country source	Purpose of research	Method used	Subjects	Major findings
Iedema et al.	2010	Aus	A study of clinical supervision to identify the quality of supervision relationships and the frequency of contact between the supervisor and the learner	Mixed methods	PGY1, PGY2, PGY3, supervising registrar, supervising consultant	• "Hands on, hands off' model purports that supervision is about discussion of treatment and the junior doctors' own learning • Junior doctors expect to act independently once they gain their supervisors' trust within a 'zone of safe learning' • Junior doctors' learning needs change over time
Isoardi et al.	2013	Aus	Learn what factors effect interns' documentation practices in emergency.	Qual	PGT1 & consultants	• Lack of formal education in documentation = medical records that are not useful produced by interns • Solution was to implement a dedicated documentation topic into interns' education program
Isoardi et al.	2015	Aus	Retrospective clinical documentation audit to determine value of dedicated documentation topic within the interns' education program	Quant	PGY1	• Clinical documentation training at the university level is poor • Clinical documentation can be enhanced by formal education
Laskaratos et al.	2015	UK	Evaluate the educational role of ward rounds for junior trainees	Mixed methods	PRHO	• This is an under-researched area of postgraduate medical education • There are issues around service provision versus education of junior doctors during ward rounds • Study increased understanding of current practices re learning opportunities during ward rounds • Suggestions offered re quality improvement of teaching on ward rounds

Authors	Year	Country source	Purpose of research	Method used	Subjects	Major findings
Mak & Plant	2005	Aus	Reducing unmet needs: a prevocational medical training program in public health medicine and primary health care in remote Australia	Design-based research	PGY1	• Designed and implemented a program to give prevocational doctors experience in remote public health medicine and primary health care • Evaluation of the program is described in separate paper
Mitchell et al.	2009	US	Develop and trial a tool to measure of the cognitive, metacognitive, and experiential aspects of residents' learning	Quant	PGY1, PGY2, PGY3	• The rCBS (Cognitive Behaviour Survey: Residency level) was developed to profile the cognitive, metacognitive and experiential aspects of residents' learning • Results indicated that the scale is reliable, and the construct is valid • rCBS could be used to explore how residents learn and evaluate education programs
Monaghan et al.	2012	US	Explore what, where and from whom residents learn	Mixed methods	PGY1-5 & program	• Most frequently learnt items = patient care and knowledge • Majority of learning = experiential • Self-directed learning ≠ a significant source of learning • Each PGY level learns differently (teacher and location) • Reflective statement = useful tool to assess curriculum
Nevin et al.	2014	US	Determine the impact of reduced working hours on graduate medical education after the implementation of the 2011 ACGME duty hour standards	Qual	PGY1, PGY2, PGY3	• Decline in teaching • Decline in experiential learning • Residents more rested and therefore improved capacity to learn outside of work hours • More personal time for reflection and study

Authors	Year	Country source	Purpose of research	Method used	Subjects	Major findings
Reines et al.	2007	US	Classify common resident tasks on the service-education continuum	Quant	PGY1-6 & consultants	• There was no definition of required education and service balance documented by Residency Review Committee • Residents and consultants agree on educational value of most tasks and also agree that the education-service balance is acceptable • Residents feel they require significantly more education time
Seltz et al.	2016	US	Explore paediatric interns' rounding experiences with and without consultants	Qual	Paediatric interns	• Different learning of content occurs in the presence and absence of a consultant during ward rounds • Learning occurs in different ways when consultants are not leading ward rounds • May be educationally valuable for interns to experience both types of ward rounds
Sheehan et al.	2012	NZ	Investigate the workplace learning that occurs during the junior doctor's first year	Qual	PGY1	• Learning in internship can be categorized as 1) concrete tasks, 2) project management, or 3) identity formation • Consider reconfiguring internship to include the concept of identity formation as "a process of becoming a doctor" (p. 943)
Singh et al.	2015	Aus	Hospital discharge summary scorecard: a quality improvement tool used in a tertiary hospital general medicine service	Quant	PGY1	• A scorecard system of assessing the quality of interns' discharge summaries can provide valuable quality improvement feedback
Smits et al.	2004	Other	Explore the personal and contextual factors that are predictive of successful learning in postgraduate medical education	Quant	PGY1, PGY2	• Predictors for success were ○ gender and learning style (related to knowledge increase, with females more likely to have a better increase in knowledge);

Authors	Year	Country source	Purpose of research	Method used	Subjects	Major findings
						○ accommodator learning styles (more conducive to improving knowledge but not necessarily performance). • Based on the results, no conclusions re which type of education might match learning styles or gender could be drawn
Tan et al.	2015	Aus	Discharge documentation improvement project: a pilot study	Quant	PGY1+	• Education + regular feedback + non-monetary incentives = improved quality of discharge summaries
Teunissen, Boor et al.	2007	Other	Investigate consultants' perspectives on how residents learn	Qual	Supervising consultants	• Residents learn by working clinically • Consultants influence what residents learn • Residents' personal knowledge gradually grows over time • Beneficial attributes of residents entering specialist training = curiosity + good interpersonal skills + willingness to improve weaknesses
Teunissen, Scheele et al.	2007	Other	Investigate how residents learn while they work clinically	Qual	Residents in training & residents not in training	• Used grounded theory to develop a framework of learning in a clinical environment • Work-related activities are the foundation of a resident's learning • Interpretation + construction of learning = expansion and refinement of the residents' personal knowledge • Learning from and with other people is recognized as being significant in this framework
Westbrook et al.	2008	Aus	An observational study to quantify how and with whom doctors spend their time on hospital wards	Qual	PGY1, PGY2+ registrars	• Two-thirds of time is spent on communication, social activities and indirect patient care. • Interns' work is significantly different to all other doctors i.e. more time on documentation and administrative activities, less on direct patient care

Authors	Year	Country source	Purpose of research	Method used	Subjects	Major findings
						• Work carried out with another doctor > half the time. • Work carried out alone = one quarter of the time • Time with patients > time with nurses or allied health staff
Wilkinson & Sheehan	2011	NZ	Investigate the workplace learning that occurs during the junior doctor's first year	Qual	PGY1	• Learning in internship can be categorized as 1) concrete tasks, 2) project management, or 3) identity formation
Williams et al.	2008	US	Focus group discussions to explore learners' attitudes towards bedside teaching and identify the barriers and possible strategies that couild be used to improve this type of teaching and learning	Qual	4th Year medical students, PGY1, PGY2	• Bedside teaching is valuable for learners, especially for learning clinical skills • Bedside teaching is underutilized • Barriers to bedside teaching include lack of respect for the patient, lack of time, learner's desire to be autonomous, faculty attitude, knowledge and skills and the excessive dependence on technology
Zhu et al.	2008	Aus	An observational study to describe how interns spend their time in emergency and determine the frequency of activities performed	Quant	Interns	• Patient-related clinical tasks = 86.6% of time • Taking histories = 17.5% of time • Performing examination = 11.3% of time • Communication for patient management = 32.6% of time • Clinical procedures = 5.6% of time • Non-patient-related administration and procedural preparation and clean-up = 3% of time • Structured and incidental education tasks = 2% of time • Emergency = unique environment with exposure to broad range of activities

Of the studies selected for further analysis, 13 were quantitative, nine were qualitative, six used mixed methods and two used design-based research methods. One additional Australian non-research-based article was included as the contents were fundamental to this study. Only thirteen of the thirty-one studies were undertaken in an Australian context, six using quantitative methods, two using qualitative methods, two using mixed methods, two using design-based research methods and the additional non-research-based paper. The findings from the included articles are described below under two headings: i) interns' work versus learning; and ii) the learning process.

1.2.2.1 INTERNS' SERVICE VERSUS LEARNING ROLES

Internationally, many medical graduates undertake a pre-registration year that is often seen as a formal apprenticeship to practicing medicine. Learning occurs as they are rotated through various specialties, working under the supervision of more senior clinicians such as registrars and consultants. Throughout the literature, the differences between interns working (i.e. undertaking processes important for patient care and hospital functioning) and explicitly learning (i.e. activities important for for growth of professional knowledge) was apparent.

The first year of practice is the time when medical graduates put theory into practice. It is a period that "tests the individual's fortitude and resolve to work in his or her chosen profession" (Brown, Chapman, & Graham, 2007, p. 659). Brown et al. (2007) investigated the transition of UK medical graduates into medical practice using mixed research methods. They discussed the fact that the stakes are much higher for the graduates than it was for them as students, with the weight of their community's expectations for them to assume the responsibilities of providing quality health care. Graduates are therefore often anxious and insecure as they navigate their way through their new professional role within unfamiliar working environments. An orientation process at the beginning of each rotation is essential to minimize the effects of the transitions from one work environment to the next. However the findings of this study indicated that many new doctors did not get enough support in the form of orientation, making them feel that in the first year of practice, "they are merely fulfilling a service rather than progressing in a training post……..a year simply to be endured" (Brown et al., 2007, p. 659) rather than progressing their career; a survival exercise rather than a learning experience. Brown et al. concluded that supervisors have an essential role

in assisting new doctors to understand their progression as professionals by being proactive in their learning to develop it further.

Ward rounds play a crucial role in providing doctors with an opportunity to review and plan patient care. In Australia, ward rounds are usually conducted by an entire medical team which often consists of a consultant, registrar, junior doctors and interns. Ward rounds concentrate on 'service', however in many cases it is also a teaching and learning opportunity. A UK research group investigated the educational value of ward rounds for the junior doctors attached to rounding teams (Laskaratos, Wallace, Gkotsi, Burns, & Epstein, 2015). Participants in this mixed methods study were Foundation Year 1 and 2 doctors. Ward rounds were perceived to be valuable in the development of "knowledge acquisition, selection and interpretation of diagnostic investigations, patient management, record keeping, and approach to patients" (p. 2), but were not perceived to be as valuable in "developing history taking, physical examination, leadership skills, or in learning ethical principles" (p. 2). Participants in this study identified that "learning atmosphere, clinical teaching, teaching style, communication expectations, and team management were … important characteristics of successful [ward rounds]" (p. 2). The study also identified "lack of time, number of patients, and team structure" (p. 3) as the main obstacles to ward rounds being effective teaching opportunities for junior doctors. The conclusion drawn from this study was that more research on the educational value of ward rounds for junior doctors is required. In 2016, an American study investigated "how interns learn most successfully" (Seltz, Preloger, Hanson, & Lane, 2016) and whether there was any difference in learning when ward rounds occurred without, as opposed to with, consultants. Interns noted that the near-peer relationships with the senior residents who ran ward rounds when consultants weren't available, made them feel more comfortable asking questions. The near-peer relationships also encouraged shared discussions about the clinical presentations. However, the interns felt that the consultant-led ward rounds were essential for exposure to clinical decision-making processes. The study concluded that although interns learnt during ward rounds regardless of whether or not it was consultant-led, different learning was evident in each type of ward round. This variation in learning opportunities prompted the researchers to suggest that it would be beneficial for interns to experience both types of ward rounds, and that further research on the educational value for cohorts other than interns was required.

UK and American medical councils have implemented duty hour restrictions for new medical graduates, the intent being to reduce workloads and improve the clinical experiences of residents. Since the1990s' introduction of these reduced working hours in the UK, the opposite has occurred; residents reported that working less hours means that they have less exposure to common clinical conditions and therefore have less learning opportunities (Gillard, Dent, Smyth-Pigott, & Eaton, 2000). American residents have also reported that since the implementation of reduced work-hours in 2011, there has been a decrease in "hands-on" clinical education since "education was often deferred in order to complete basic patient-care tasks" before the end of each shift (Nevin et al., 2014, p. 3). The positive aspect of the restricted work-hours has been that residents may have more time outside of work-hours for independent study, however this does not fully compensate for the reduction in on-the-job training. In particular, Nevin et al. (2014) reported that surveyed residents identified inadequacies in the PGY1 training in procedural skills and clinical reasoning. These two studies identified that the long-term effects of reduced duty hours for PGY1s is unknown. In particular, more research is required to determine the effects of reduced working hours on graduates' medical education.

Westbrook, Ampt, Kearney & Rob (2008) identified that much of the focus of previous research has been on the time that doctors work and not on what they actually learn while they are at work. Their quantitative observational study aimed to quantify how much time interns, residents and registrars spend undertaking the various activities required as part of their rostered day, as well as identifying with whom they spent this time and what information tools they use. This was essentially a time and motion study. Information was collected using a work task classification system that was designed for a handheld computer. Results showed that doctors at all three levels spent the majority of their time on 'professional communications' (33%; range 29 – 38%), with 'social activities' being the second highest use of time (17%; range 13 – 21%) above both 'indirect care' (17%; range 15 – 19 %) and 'direct care' (15%; range 13 – 17%). According to this study, only 7% (range 6 – 7%) of time was spent on 'supervision or education'. There was a major limitation with this study in that the observations were done in one-hour time blocks at varying times of the day between 08:30 and 19:00 hours on weekdays only and over a six-month period. This meant that the results were not generalizable to weekends, evenings or early morning shifts. Additionally, they did not account for the fact that some days can be busier than others, especially if the doctor has had an on-take day. Lastly, there was no accounting for the fact that the

way interns and registrars worked may have changed over time as a result of what they had learnt, that they may have become more efficient in the way they worked. In this study, Westbrook et al. (2008) attributed this type of improvement to the Hawthorne effect where a study subject improves their performance in response to the fact that they are being studied.

Zhu, Weiland, Taylor & Dent (2008) undertook a similar quantitative observational study, where they aimed to investigate how interns spent their time in an Australian emergency department setting. However, this study sampled interns working over 24-hour periods and measurements were done with a stopwatch. The task check list that was used to collect data was also more comprehensive and this was used to calculate the range, frequency, duration and context of activities performed by the interns. Indirect patient management such as communication, consultation and documentation took up the bulk of the interns' time (43.9%). Education for professional development which consisted of using information technology and attending Emergency Department-based meetings, lectures and tutorials made up only 1.7% of the interns' time. There was no mention of what the interns learnt during this time or whether other informal learning occurred at the bedside. The biggest limitation in this study was that the results of the one week of study were extrapolated to cover a full eight weeks, the length of the term; data were multiplied by eight. This assumed that the interns' case-mix and case-load were exactly the same week after week. This study also attributed possible improvement of performance to the Hawthorne effect, rather than to the possibility that interns were learning to do things differently and/or more efficiently as a result of their professional interactions with more senior clinicians.

A more recent 'time and motion' study was conducted by a group of researchers from the Royal Perth Hospital (Chen, Ngo, Chew, Teo, & Zellweger, 2017). Interns recorded the tasks they completed in 15-minute blocks of time during one or two of their shifts. Tasks were categorized as professional communication, direct patient care, procedure and theatre, teaching, discharge summaries, medical note documentation, clerical matters, or personal time. However, in the evaluation of this data, categories were grouped into direct patient care (22.53% of each shift), indirect patient care (74.83% of each shift) or personal time (3.64% of each shift). Results of this study suggested that interns spent more time completing discharge summaries than another other task (26% of each shift). Direct patient care varied greatly with the average being 12.75% of each shift; however, a number of interns reported no direct contact with patients

during their shifts. Interns working in emergency medicine had more direct contact with patients each shift than in any other rotation. Interns also reported that on average, only 2% of each shift involved teaching. The study concluded that modern interns have higher levels of clerical and administrative burden and a corresponding lower level of clinical exposure than interns of the past. An earlier American 'time and motion' study of intern work whilst on call revealed similar results. Fletcher and her American research team (2012) reported that considerable time each shift was attributed to clinical computer work (40% of each shift). This included writing/editing documentation, orders and chart reviews. Results showed that only 12% of American intern time during a shift was spent at the bedside, and as in the Australian setting, only 2% of time on shift could be attributed to teaching/learning activities.

A UK mixed methods study investigated the concept of a junior doctors' training/service continuum (Derrick, Badger, Chandler, Nokes, & Winch, 2006). The study subjects were senior house officers (PGY2+). However, the study was undertaken prior to the introduction of the two-year internship in the UK, the Foundation Years, which includes PGY1 and PGY2. Mixed methods were used to investigate where various activities would be placed along the training/service continuum and what factors would influence these positionings. Findings from both the quantitative survey and the qualitative focus groups concluded that the higher the frequency of the task, the lower the perceived training focus in that task. While not specifically related to the proposed study, this article did document a comprehensive list of junior doctors' daily tasks that were considered in the development of resources to study the content and mode of interns' learning.

In 2007, the UK hospitals' service and education activities were still being studied and defined. Reines, Robinson, Nitzchke & Rizzo (2007) undertook a study to categorize resident activities, however the focus of their study was in surgery only and the sample size was small. The study found that whilst the residents and attendings participating agreed on the definitions of "education" and "service", they had differing views on how much education residents required. The study concluded it was important that clear definitions of "service" and "education" were developed so appropriate learning could be facilitated.

1.2.2.2 THE LEARNING PROCESS

Apprenticeship learning

The majority of junior doctors' learning occurs as a result of clinical bedside teaching and learning (Teunissen, Scheele, et al., 2007). Although different countries have different learning curriculum requirements, where this has been researched, evidence showed that the junior doctors' perceptions of the quality and usefulness of the teaching and learning they receive was high (Dent et al., 2006; Higgins, Cavendish, & Gregory, 2006). A cross-sectional cohort of Australian prevocational doctors (Dent et al., 2006) reported adequate exposure to learning through their registrars and consultants and indicated that this teaching and learning was useful. The study concluded that training programs should address prevocational doctors' lack of confidence in being able to manage emergencies, choose careers, meet their medico-legal obligations and perform clinical procedures. They should also provide more high-fidelity simulation training, more registrar and consultant teaching and more contact with consultants. Interestingly one of the "desired future exposure to educational methods" included formal teaching (p. 439).

Williams et al. (2008) concentrated their American research specifically on trying to improve bedside teaching and learning. The problem they identified was that contrary to the view that most learning for junior doctors occurs at the clinical bedside, only 8 – 19% of time was reportedly devoted to this type of teaching and learning, and prior research was focused on the teachers' perspective rather than the learners' perspective. Their qualitative study therefore explored learners' attitudes to this clinical bedside teaching and further identified the barriers to learning and possible mitigation strategies. Six small focus groups consisting of medical students (groups 1 & 2), first year doctors (groups 3 & 5) and second year doctors (groups 4 & 6) were interviewed for 60 – 90 minutes each. Open-ended questions were used to explore opinions and experiences of bedside teaching, and learners were asked to clarify what was learnt and comment about the quality and quantity of the bedside teaching they received. The themes identified from the transcripts were almost self-selecting, as they were no different to the questions posed. This may be a result of poorly worded questions or results may have been based on a purely deductive analysis. Results showed that there was a difference between the opinions and experiences of medical students and working residents. Bedside teaching was perceived by residents to be underutilized, even though it was thought to be an essential mode of teaching for learning about physician-patient communication, physical examination, clinical reasoning and

professionalism. Learners felt that there were missed learning opportunities in observing consultants' and registrars' interactions with patients. Barriers were classified as personal, interpersonal or environmental and mitigating strategies also reflected these themes. This study focused on learners' opinions about bedside teaching but did not explore whether an increase in bedside teaching would lead to better learning outcomes or enhanced patient care. The most interesting finding in this study was the learners' "belief that technology has supplanted the medical history and physical examination undermines bedside teaching" (Williams et al., 2008, p. 262).

An Australian pilot study investigated the types of supervision experienced by junior doctors and registrars (Iedema et al., 2010). This mixed methods study required junior doctors to record details of the type and frequencies of all of their supervision experiences, to rate these experiences and to diarize reflections over a two-week period. Being a pilot study, the sample size was very small (five junior doctors, five registrars and five consultants) from one small rural facility only, so drawing any conclusions from this study required great caution. What the study revealed was that 36% of all contacts with supervisors were made during ward rounds. Only 4% of contacts with supervisors consisted of pre-structured or planned education sessions.

Another conceptual framework for intern learning was presented at the 16th National Prevocational Medical Education Forum in New Zealand by Dale Sheehan (Wilkinson & Sheehan, 2011). This work was published the following year (Sheehan, Wilkinson, & Bowie, 2012). The qualitative study undertaken by this research team involved conducting focus groups with interns nearing the end of their internship. It essentially sought to learn more about the skills that the interns had developed throughout their internship year. The three themes that were identified to organize the skills learnt by interns were: i) concrete tasks; ii) project management (paperwork, organization, preparing for ward rounds, discharge planning, liaising with other team members, negotiating with and providing advocacy for patients and their families, prioritization); and iii) identity formation (becoming a worker, making mistakes and determining their limits, developing a professional image, managing emotions and professional relationships). The implications of these findings was a questioning of whether or not supervisors were provided with the necessary skills they required to 'coach' the interns and whether or not interns were being assessed correctly when many of the skills identified in this study were related to tacit knowledge that was not currently considered (Sheehan et al., 2012).

Two parallel qualitative studies were undertaken by a Netherlands research group (Teunissen, Boor, et al., 2007; Teunissen, Scheele, et al., 2007) to investigate the perceptions of how residents learnt. These studies used a 'grounded theory' approach to identify the perspectives of both the learner and their supervisor. Teunissen, Scheele, et al. (2007) provided empirical evidence of how residents learnt. They proposed that resident learning starts when they actively participate during their daily work schedule. Participation in clinical activities was therefore central to that learning. However, interpretation of codified knowledge, construction of meaning and reflection on personal knowledge are essential components of the learning process that resulted in growth of personal knowledge (Teunissen, Scheele, et al., 2007). As a response to the findings, Teunissen, Boor, et al. (2007) developed a "Framework of Learning in the Clinical Workplace" which described the relationships between these factors. The framework incorporated aspects of Kolb's experiential learning cycle and Lave and Wagner's socio-cultural description of situated learning to further elaborate a theoretical construct of learning in the clinical workplace. Interviews conducted by Teunissen, Boor, et al. (2007) with residents' supervisors identified three major themes:

1. The central role of participation in clinical activities. This involved the learners being immersed in clinical practice and learning through problem-solving clinical cases on their own. Learners were allowed to make mistakes in a safe, supervised environment. Learning was constructed; however codified knowledge was enhanced via the teaching of the theoretical background.
2. The input of the supervisors. This focused on the external influences on the junior doctors' learning processes of interpretation and construction of meaning. This could occur simultaneously or retrospectively with patient interaction; it could occur as clinical bedside teaching or as case-based learning after the event.
3. The supervisors' views on residents' development and capabilities. This described the growth of a resident's personal knowledge with the accumulation of experience. Supervisors perceived their roles to be that of clinical advisors and to ensure patient safety. They did not see themselves as having any direct influence on the attributes junior doctors required to enter specialist training.

These perceptions complemented the perceptions of the learners (Teunissen, Scheele, et al., 2007). There were two major limitations to Teunissen et al.'s parallel studies. Firstly, the studies were restricted to one specialty only and secondly, they

focused on knowledge acquisition and did not address the question of how personal knowledge influences actions or behaviours.

Mitchell, Regan-Smith, Fisher, Knox & Lambert (2009) aimed to draw attention to learning behaviours by profiling "the cognitive, metacognitive and experiential aspects of [junior doctors'] learning." They hypothesized that

> *The greater the presence of higher-order thinking in [residents'] learning, the more likely they will be able to handle complex clinical situations such as resolving contradictions in clinical data or bringing order to situations involving simultaneous, critical clinical events (such as prioritization of multiple patient problems and their management) (p. 918).*

The legacy of this cross-validation survey is a tool that was designed to measure seven scales of learning, namely memorization, conceptualization, reflection, independent learning, critical thinking, meaningful learning experience and attitude toward educational experience. However, the authors acknowledged that there was still further research to be done on this tool before it could be confidently used, as some of the scales did not correlate as would have been expected. The published study focused more on the development of the Cognitive Behaviour Survey: Residency Level (rCBS) than it did on the actual learners in the test cohort and their learning behaviours.

In fact, little information about the factors that could be used to predict successful learning outcomes for postgraduate medical education were identified in the literature. One 'follow-up' study of junior doctors tried to establish which personal and contextual factors could be used as predictors of success (Smits et al., 2004). The identified predictors were:

- gender and learning style (related to knowledge increase, with females more likely to have a better increase in knowledge);
- accommodator learning styles (more conducive to improving knowledge but not necessarily performance).

Interestingly, course design (problem-based or non-problem-based) had no overall effect on success (Smits et al., 2004).

An intern's learning is not solely dependent on bedside teaching and learning. A number of papers outlining strategies for teaching and learning clinical documentation,

including discharge summaries, have been published since 2000. In 2013, a Queensland research team explored the medical record documentation practices of interns in an emergency department (ED) (Isoardi et al., 2013). At the time of the study, there was no formal documentation training for the interns. Evidence showed that although interns received high levels of support from their supervisors, the lack of formal training in documentation was instrumental in the ED interns producing medical records that were not as useful as they needed to be. The recommendation made by the researchers was that a subject based on recording clinical documentation be introduced into the intern education program. This was implemented and in 2015, a new research team led by the same principal researcher evaluated the formal medical documentation program (Isoardi, Spencer, Sinnott, & Eley, 2015). The education program targeting skills such as recording patient characteristics, clinical impressions and management plans using a customized score sheet had a positive impact on the standard of the interns' clinical documentation. A third research group at the same hospital designed a hospital discharge summary scorecard tool to assess the quality of discharge summaries and provide feedback to interns (Singh, Harvey, Dyne, Said, & Scott, 2015). This formalized strategy provided regular opportunities to not only assess the quality of discharge summaries, but also to implement quality improvement processes through the formal feedback provided to the interns. A Western Australian research team conducted a similar discharge summary quality improvement pilot study with similar results (Tan, Mulo, & Skinner, 2015). Both discharge summary improvement studies found that they needed incentives for the interns to regularly submit discharge summaries to be assessed.

Another form of learning involves reflection. An American research team developed a tool for residents to learn through reflection (Monaghan et al., 2012). This qualitative study required residents to identify what the best thing was that they had learnt during the week, who taught them this thing and where they were when they learnt it. Analysis of surveys revealed that knowledge and patient care were the most commonly identified 'best learning'. The learning of professionalism increased as residents moved from one-year level to the next. Most of the identified 'best learning' occurred as a result of experiential leaning in the wards and operating rooms, and self-directed learning was not a significant part of their learning overall. The amount of learning in the wards decreased as the residents progressed from one-year level to the next. PGY1s learnt from a variety of sources i.e. consultants (53.7%), other residents (33.6%) and other means (12.7%). In contrast, PGY5s' learning was mainly through

interactions with their consultants (72.4%), while 13.8% of their learning occurred via other residents and other sources equally. The study noted that since self-learning was essential for assimilation of knowledge, more research was required to quantify the hours residents spent in pursuing self-learning.

Self-directed learning

Many educational interventions that have been explored as solutions to junior doctors' lack of knowledge and/or skills focus on strategies for specific learning deficiencies e.g. public health medicine in remote Australia (Mak & Plant, 2005), digital rectal examination, management of acute urinary retention, and management of urinary tract infection (Chung & Sprott, 2008). Similarly, Boots, Egerton, McKeering & Winter (2009) undertook a quantitative study to assess interns' experience and confidence in carrying out bedside procedural skills, before developing and trialling a lunch-time procedural skills workshop over a ten-week period. This intervention, like many others, focused purely on improving knowledge and skills rather than supporting changes in learning behaviours that support lifelong learning.

Agnew & O'Kane (2011) incorporated aspects of adult learning principles and self-directed learning to develop an innovative framework of continuing medical education (CME) points for interns in Australia. This framework provided interns with scaffolding to continue their learning, offering flexible learning options that encouraged self-directed learning behaviours. The CME points system provided incentives for interns to choose learning activities that suited their learning styles and met their learning needs. However, the study did not investigate the drivers of this learning, nor did it measure the change in self-directed learning behaviours over time as a result of using the CME points system.

The *Australian Curriculum Framework for Junior Doctors* (Confederation of Postgraduate Medical Education Councils, 2008) was developed to act as a learning guide and to essentially provide a learning bridge between undergraduate and postgraduate curriculums. The framework documents the knowledge, skills and behaviours that are deemed necessary for junior doctors to be able to practice safely. The framework was initially developed as a tool for planning learning. It is currently marketed as a set of core competencies and capabilities; however, the developers of this framework acknowledge that at the time of this literature review being undertaken, there were no mechanisms for the formal assessment of competencies. In order to

address this situation, the AMC commissioned a consultation paper to articulate the understanding of the terms '*competence', 'competency'* and '*competence-based training*' (AMC Competency-based Medical Education Working Group, 2010). The consultation paper noted that "observed performance is more than the sum of the set of competencies used" (p. 3) because competency-based assessment does not take into consideration the tacit learning that is essential for the development of clinical reasoning and professional judgments. At the time of undertaking the initial literature review, feedback on this paper had been considered, but actions had not been decided.

1.2.3 DISCUSSION

The main finding of the literature review was that there is a paucity of intern-specific research. Keywords used in the search for articles were expanded beyond intern-related terms to try to identify relevant studies for inclusion. Published intern-specific research in an Australian context is almost non-existent. Assessment of the transferability of the findings to the Australian pre-registration medical landscape needed to be carefully considered.

The review found that while no other model has been accepted to replace the formal apprenticeship model of learning for junior doctors in Australia, the actions of the AMC in commissioning a consultation paper on competence-based medical education supports the argument that the concept of an apprenticeship as the key method of junior doctors' learning is under scrutiny (AMC Competency-based Medical Education Working Group, 2010). Although there was considerable general education and medical education literature, little research had a focus on intern learning which is inherently different because of the essential relationship between the supervisor and the intern, the 'master' and the 'apprentice'. Most of the research that has been conducted on interns focuses on the frequencies of undertaking various tasks or use time as the main variable; time spent undertaking various tasks, time spent with supervisors, time spent doing work versus time spent in education. There are some studies which focus on clinical bedside teaching and learning, however these again focus on time as a variable and report attitudes to learning. This review has shown that there has been little research into what and how (by what methods) interns learn.

The two parallel studies completed by Teunissen et al. (2007a; 2007b) provided the only empirical evidence available of what actually happens when junior doctors learn. The studies provided evidence that situated learning was an essential part of junior doctors' learning in the clinical workplace, but improving codified knowledge was also essential to improving personal or professional knowledge. No study of how personal knowledge influences actions and behaviours was found.

1.2.4 CONCLUSION

The pathways for medical graduates in Australia are different to most other countries, with a one-year internship followed by several prevocational years prior to entry into a specialty college training program. One of the main barriers to this study was the lack of published research in prevocational education in Australia from which some theoretical basis could be drawn. This could also be seen as an advantage rather than a barrier; however, there were so many gaps in the research that it was difficult to know where to start. With this in mind and because it was part of the needs-based research being undertaken to provide in-situ best evidence medical education for the hospital, this study was restricted to investigating if the "learning environment is less personal, …. and captive to self-directed learning" (Van Der Weyden, 2006, p. 313).

1.3 THE WAY FORWARD

There were a number of gaps identified in the literature that this study aimed to address. These included investigation of:

- the degree to which apprenticeship learning was used by interns;
- the details of how and what interns are currently learning; and
- the drivers of learning that accompany the transition from student to intern.

1.3.1 A DEFINITION OF 'APPRENTICESHIP' LEARNING

Van Der Weyden (2006, p. 313) claims that "apprenticeship has been an integral part of medicine since antiquity, and its value persists in modern times". However no clear definition or description of the apprenticeship of medicine in Australia has been

published. In reality the current apprenticeship model of learning in medicine may be broad and complex, consisting of learning relationships that extend outside of the junior doctors' immediate supervisors. In order to collect and analyse data for this study, a definitive definition of 'apprenticeship' learning needed to be applied. This was done from a theoretical perspective using the available literature.

For the purposes of this study, a combination of psychological, educational and philosophical perspectives was used to define 'apprenticeship' learning (Nielsen, 2010). This combination of perspectives not only encompasses the learning via modeling by a 'master' followed by mimicking by the 'apprentice', but also incorporates the learning of tacit knowledge through the 'apprentice' observing more experienced 'masters'. The relationship interns have with their supervisors is therefore very important for their transformation into competent, independent medical practitioners. For the purposes of this study, 'apprenticeship' learning was therefore defined as any learning that occurred as a result of the relationship interns had with their supervisors, i.e. their consultants and/or their registrars. This included formal weekly education sessions organized and delivered didactically by the supervisors in the various rotations. All other learning, including attendance at education sessions which were designed for any practitioner to attend such as Grand Rounds, was considered to be not directed by the interns' supervisors and was therefore classified as 'self-directed' learning i.e. it was learning that was instigated by the interns themselves.

1.3.2 AIM

Rather than working to determine if the 'apprenticeship' model of learning was the best model for 21st Century medical interns in the context of a North Queensland Teaching Hospital, the purpose of this study was to investigate the actual methods of their learning, to elucidate 'what was' (e.g. is apprenticeship-based learning still occurring, and if so, to what extent), and to determine if "the learning environment is less personal, …. and captive to self-directed learning" (Van Der Weyden, 2006, p. 313). As Van Der Weyden's quote was the stimulus for this study, its interpretation is paramount to developing the questions to be investigated. The researcher's perspective is that the "learning environment [being] less personal" refers to the fact that for interns, the dilution of supervision and direct learning opportunities from consultants results in less contact with the consultants and therefore, less apprenticeship learning occurs than in times past. As a consequence of this, interns

are increasingly driven to learn via self-directed modes of learning i.e. interns may be "captive to self-directed learning". The study also investigated what drives interns to learn in the way that they do.

The main question this study was investigating was:

"How do medical interns learn in the 21st Century?"

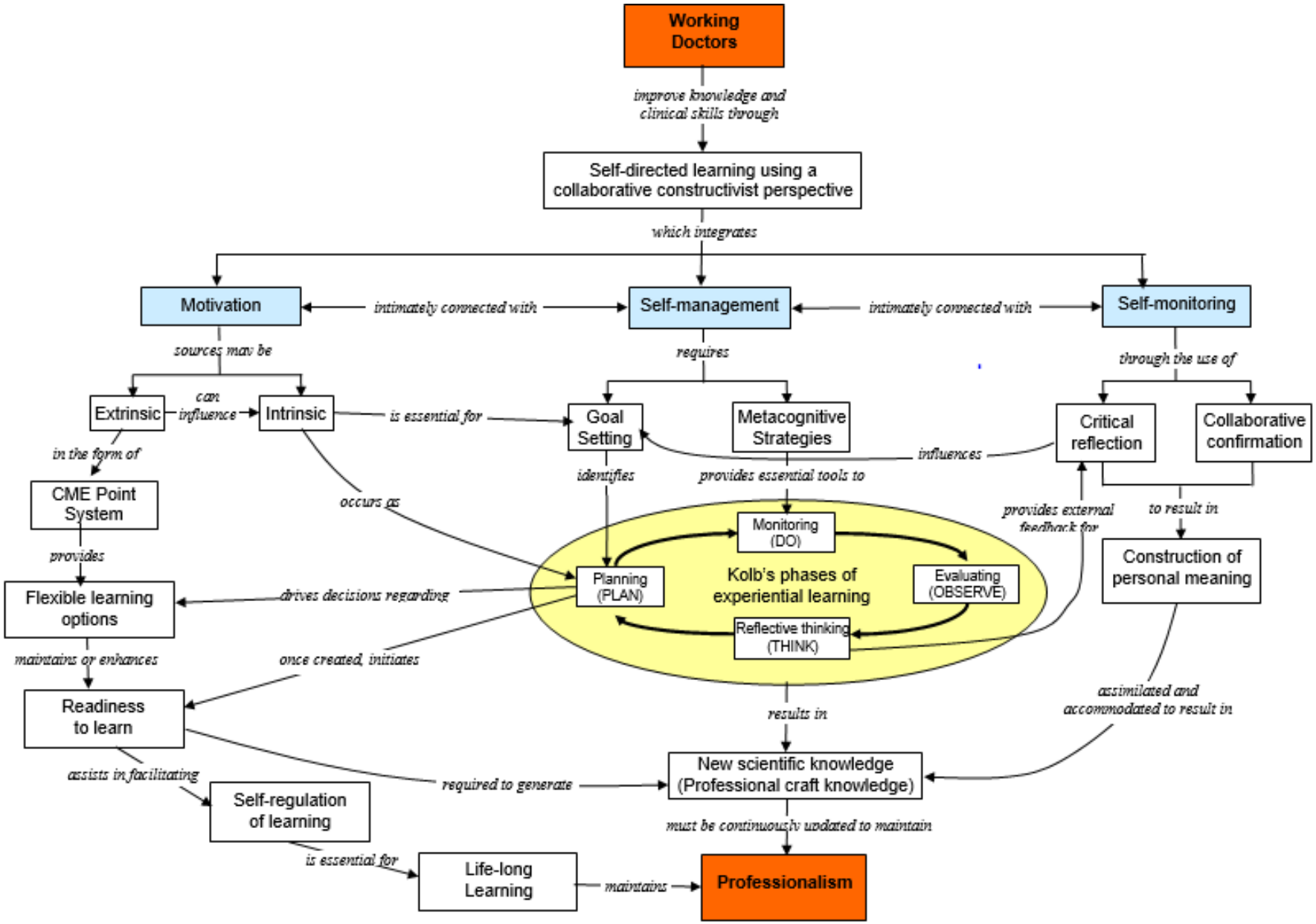
The sub-questions are:

1. From whom or from what do interns learn and what specifically do they learn via these encounters?
2. To what degree do interns still learn via an apprenticeship model, if at all, and how much of an intern's learning is self-directed?
3. What drives interns' learning in these directions?

1.4 CONCEPTUAL FRAMEWORK

A conceptual framework, informed by literature and the principal researcher's own experiences as a medical education officer, was constructed for this study (Figure 2). This framework identifies the working doctor as its foundation and diagrammatically represents aspects of how doctors take responsibility for their learning and continuous improvement to become trusted and valued medical professionals by the communities they serve.

Figure 2: Conceptual framework



Medicine is essentially a scientific endeavour. As scientists, doctors need to make sense of their clinical practice, and to generate new knowledge through scientific endeavours using the 'scientific method' of identifying a problem, planning the methods of investigating the problem, collecting data, analyzing data and drawing conclusions that will be considered in effecting a change. Much of this new information is shared with other medical practitioners in the form of published papers, and as with any scientific community, doctors' methods and results are scrutinized closely to ensure there is validity in the conclusions. These published works add to the propositional knowledge available to the working doctor. As a compendium of current provisional knowledge and understanding learned from the knowledge of the professional field, this posteriori scientific knowledge can be used as a reference framework (Higgs & Andresen, 2001) for an individual doctor's quest for continuous improvement in knowledge and excellence in practice, as expected by the community they serve.

Explicit knowledge is knowledge that has been documented and accepted as propositional or public knowledge (Polanyi, 1958). However, a doctor's professional practice or craft knowledge consists of more than just the explicit knowledge that is available for reference. The AMC Competency-based Medical Education Working Group (2010) noted that tacit knowledge is also critically important to build overall competence. Tacit knowledge is difficult to articulate and therefore difficult to teach (Polanyi, 1966), however it is essential knowledge for doctors to be able to make clinical judgments when dealing with complex clinical presentations. Tacit knowledge is the practical knowledge and competencies doctors require for good clinical decision-making skills. These can only be gained over time (AMC Competency-based Medical Education Working Group, 2010) as the 'apprentice' interns observe more experienced 'masters'. Experiential learning can provide a platform for interns to learn through experience (Kolb, 1984) and develop their clinical decision-making skills.

Doctors' individual knowledge also includes their own personal knowledge or knowledge from their life experiences, and their professional craft knowledge which develops from their own professional experiences (Higgs & Andresen, 2001). Much of this professional knowledge is gained through the self-directed and self-regulated learning behaviours that are necessary for doctors to maintain professionalism.

The six concepts that therefore constitute the conceptual framework are self-directed learning, motivation, self-management, self-monitoring, self-regulated learning, and

lifelong learning and professionalism. Each of these are described in turn in the sections that follow.

1.4.1 SELF-DIRECTED LEARNING

The concept of self-directed learning acknowledges an adult's need to learn on their own, instead of being directed by an institution or a particular teacher (Houle, 1988; Tough, 1967, 1971). Unlike children, as adult learners mature, they are capable of, and do take control of many parts of their own learning (Knowles, 1970) including setting the goals for their learning and assuming ownership of the processes of learning (Candy, 1991).

Spencer and Jordan (1999) suggest that self-directed learning is "the most efficacious approach for the continuum of medical education, particularly when learning is based on experience, and new knowledge and understanding can be integrated into the personal and professional context of the individual" (p. 1281), and that it is "the educational strategy most likely to produce doctors prepared for lifelong learning and able to meet the changing needs of their patients" (p. 1280).

Guglielmino (1978) defined the highly self-directed learner as:

> *… one who exhibits initiative, independence, and persistence in learning; one who accepts responsibility for his or her own learning and views problems as challenges, not obstacles; one who is capable of self-discipline and has a high degree of curiosity; one who has a strong desire to learn or change and is self-confident; one who is able to use basic study skills, organize his or her time and set an appropriate pace for learning, and to develop a plan for completing work; one who enjoys learning and has a tendency to be goal-oriented. (p. 73)*

While a part of the junior doctors' learning will still occur through clinical bedside teaching and learning, or situated learning (Kilminster, Zukas, Quinton, & Roberts, 2011; Lave & Wenger, 1991) via the 'clinical apprenticeship', self-directed learning requires the junior doctors to diagnose their own learning needs and to pursue professional development opportunities outside of the relationship they have with their supervisors. Consequently, if junior doctors' learning is going to be predominantly via self-directed learning, 'formal' education sessions to acquire codified knowledge as

personal knowledge will be more important than when learning occurs via an apprenticeship model of learning only.

Much of a doctor's learning is via active enquiry and is therefore often cognitively constructed. Derry (1996) profiles a number of different perspectives on how this occurs, but makes a conclusion that in cognitive constructivism, individuals construct their knowledge within a social context. More specifically, learning in the form of new scientific knowledge can be gained through radical constructivism when schema change occurs as a result of research, and the subsequent assimilation and accommodation of new schema occurs. Throughout this process, self-awareness plays a central role in the formation of schema. This is a Piagetian perspective of knowledge acquisition (Derry, 1996), where learning occurs as a result of schemata developing over time (Wadsworth, 1971).

However, in reality, junior doctors may not have the skills to gain knowledge through radical constructivism alone. They may also require some interaction with peers, to use them as a sounding board for determining what knowledge is worthwhile and what is not for the construction of new meaning; a combination of both personal and social constructs of meaning is used (Garrison, 1997). This collaborative construction of meaning results in learning for junior doctors that has both personal meaning and social value that is important to the medical profession as a whole, that is, their professional craft knowledge (Higgs & Andresen, 2001). Collaborative constructivism consists of three dimensions which are intimately connected in the learning process. These dimensions are motivation, self-management and self-monitoring (Garrison, 1997).

1.4.2 MOTIVATION

Motivation is essential in the initiation and continuation of efforts to learn. Individuals can be goal-oriented, activity-oriented or learning oriented (Houle, 1988). While adults have a natural tendency to question why they need to learn something before they actually start the task of learning, they also tend to be more motivated to learn if they feel that it will help them in some way, for example, to improve their quality of life or self-esteem, or simply for self-satisfaction (Knowles, Holton, & Swanson, 1998). These motivating factors can be defined as either intrinsic or extrinsic.

Intrinsic motivation is defined as “the doing of an activity for its inherent satisfactions rather than for some separable consequences” (Ryan & Deci, 2000, p. 56). In the case of learning, the activity is undertaken for volitional reasons determined by the learner. On the other hand, extrinsic motivation is defined as “an activity [that] is done in order to attain some separable outcome” (Ryan & Deci, 2000, p. 60). However, this does not necessarily mean that a learning activity is undertaken completely non-autonomously, as there is a variance in the degree of personal endorsement by the learner, depending on the value that they place on the activity (Deci, Koestner, & Ryan, 1999). This then means that an extrinsic motivator or external reward can influence or trigger intrinsic motivation; however, there is a delicate balance between the two.

Deci, Koestner & Ryan (1999) analyzed 128 studies showing that tangible rewards can have a negative effect on intrinsic motivation, meaning that the more rewards that are given, the less likely that the learner will want to learn without a reward. When the reward is informational however, there can be a positive effect on intrinsic motivation (Ryan, Mims, & Koestner, 1983). This requires keeping authoritarianism to a minimum while providing learning options that allow learners to make choices, putting an emphasis on the challenging aspects of the tasks and providing feedback on good performance (Deci, Eghrari, Patrick, & Leone, 1994, cited by Deci et al, 1999).

Additionally, there are many other factors which can affect an adult’s level of readiness to learn, including their past experiences, their psychological characteristics, the other people around them that have influence, as well as the wider community and societal influences (Tough, 1971). However, a person’s predilection to be self-directed in their learning can be improved through the implementation of appropriate educational interventions (Guglielmino & Guglielmino, 2007).

1.4.3 SELF-MANAGEMENT

Self-management of learning in a collaborative constructivist model involves the learner not only taking control of external tasks and learning activities, but also taking responsibility for construction of new meaning and cognitive monitoring of the learning process itself (Garrison, 1997). Self-management of learning essentially focuses on the social and behavioural aspects of the learning, with the learner taking control of the learning environment. This requires the learner to set learning goals and make use of metacognitive strategies to achieve those defined goals.

Metacognition is defined as “people’s knowledge of their own learning and cognitive processes and their consequent regulation of these processes to enhance learning and memory” (Ormrod, 1999, p. 319). Metacognitive strategies are therefore the strategies that are used in this process of learning from experience or experiential learning.

Kolb (1984) argues that “learning is the process whereby knowledge is created through the transformation of experience” (p. 38). Experiential learning is learning that has personal involvement and is learner-initiated, evaluated by, and has pervasive effects on, the learner. Experiential learning occurs naturally throughout our lives in the form of personal change and growth (Rogers, 1969). Kolb’s Experiential Learning Model (1984) states that learning is facilitated through a four-stage learning cycle of experiences which includes reflective observations (Observe), abstract conceptualizations (Think), active experimentation or application of knowledge to new situations (Plan) and concrete experiences (Do). Learners work through each of these as they self-manage their learning. Collaborative learning tools such as information processing, experiential growth, pattern recognition and sociocultural dialogic activities can be used to enhance learning (Bonk & Cunningham, 1998).

For doctors, this results in the formation of a person’s new scientific knowledge or professional craft knowledge to maintain their professional responsibilities to the public that they serve. Experiential learning may also be the key to the development of tacit knowledge which is essential for the development of the young professional (AMC Competency-based Medical Education Working Group, 2010).

1.4.4 SELF-MONITORING

Intimately connected with self-management, self-monitoring involves the use of critical reflection and collaborative confirmation to monitor the cognitive and metacognitive processes of learning. For example, this process may include a reflection on “how [the learner’s] current personal knowledge relates to that of others, and they may think about how their personal knowledge will enable them to perform in future activities” (Teunissen, Scheele, et al., 2007, p. 767). Self-monitoring essentially requires the learner to “think about [their] thinking” (Garrison, 1997, p. 24) to achieve their learning goals. New knowledge is assimilated and accommodated to result in the construction

of personal meaning and the formation of new scientific knowledge or professional craft knowledge.

1.4.5 SELF-REGULATED LEARNING

A person who is capable of self-regulating their learning is said to "display initiative and perseverance, and adaptive skills in pursuing [the learning] (Zimmerman, 2001, p. 1). A self-regulated learner is different to a self-directed learner; not only are they active participants in their own learning making their own decisions about what they learn, but they also make decisions about how they learn and the depth to which they gain an understanding of their new knowledge (Zimmerman, 2001).

There are several definitions of self-regulation, each reflecting different perspectives of what the process of learning entails. Pintrich (2000) defines self-regulation as "an active, constructive process" (p. 435). Paris and Paris (2001) link self-regulation with the individual's autonomy and control over their learning through monitoring, directing and regulating their own actions in order to acquire information to expand their expertise and to therefore self-improve. In general however, self-regulated learning is defined as being guided by a learner's metacognition, strategic action, intrinsic motivation (Butler & Winne, 1995; Winne & Perry, 2000) and affective factors (Pintrich, 2004) which corresponds with Zimmerman's view of self-regulated learning that learners are self-regulated when they are active participants metacognitively, behaviourally and motivationally in their own learning processes (1986, cited by Zimmerman, 2001). Self-regulation is essential for lifelong learning.

1.4.6 LIFELONG LEARNING AND PROFESSIONALISM

The physicians' charter on medical professionalism describes medical professionalism as "the basis of medicine's contract with society" and that the "principles and responsibilities of medical professionalism must be clearly understood by both the profession and society" (Members of the Medical Professionalism Project, 2002; World Federation for Medical Education, 2003). One of the ten professional responsibilities defined in this charter is the commitment to professional competence.

For a working doctor to demonstrate professionalism, they need to be lifelong learners. This means that they know how to learn and can learn through self-regulation. Self-

regulated learning with a collaborative constructivist perspective implies that doctors learn via self-construction which is a continuous process (Candy, 1991) rather than a means to an end, but they will not do this in isolation (Teunissen, Scheele, et al., 2007). In doing this, a doctor will become the product of their self-construction, that is, a professional.

Senior clinicians demonstrate their commitment to continuous learning through CME, maintenance of professional standards (MOPS) or continuing professional development (CPD) programs (World Federation for Medical Education, 2003). Each of these programs entail the clinicians keeping records or their participation in learning activities, however there are some differences in what these programs include. CME enables clinicians to keep abreast of advancing medical knowledge (Committee on Planning a Continuing Health Care Professional Education Institute, 2009). It consists mostly of face-to-face, didactic learning opportunities. MOPS focuses on active learning and includes, for example, learning activities such as peer reviews of the clinician's practice, clinical attachments and skills workshops (Royal Australasian College of Surgeons, 2010). On the other hand, CPD encompasses both CME and MOPS, as well as managerial, social and personal skills (Peck, McCall, McLaren, & Rotem, 2000). From this point of view, CPD reflects the wider contexts in which medical education occurs.

1.5 SUMMARY

In this chapter the literature was reviewed, and the aims of the thesis were introduced. The literature review revealed that there has been little research specific to how medical interns learn conducted and published in peer-reviewed journals. The small number of identified studies that focused on Australian interns suggests that there is considerable research still to be undertaken to enable a full understanding of the Australian working environment for medical interns and how that impacts on their ability to learn. The next chapter will describe the methodology used to answer the research questions.

CHAPTER 2 - METHODOLOGY

2.1 INTRODUCTION

With so little research on interns' learning being published, there is much scope for further investigation into the who, what, when, where, why and how of interns' learning:

- who (or maybe what) they learn from;
- what they actually learn in these interactions;
- where the learning occurs (the physical location and which allocated terms);
- when this learning takes place (whether it is prospective, situated or retrospective);
- the setting of the learning;
- the drivers for that learning occurring; and
- the mode of learning (is it via an apprenticeship model or is it self-directed?).

2.1.1 RESEARCH DESIGN

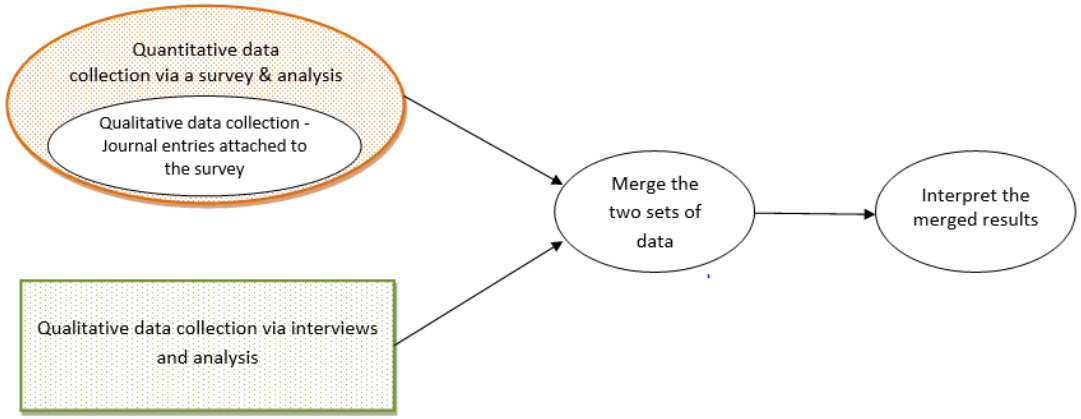
To cover this broad scope, a concurrent mixed methods study was designed and conducted. Mixed methods research has been defined by Tashakkori and Creswell (2007) as "research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry" (p. 4).

This study was an exploration of 'learning' in medical internship in Australia. It utilized a concurrent triangulation mixed methods design consisting of a combination of embedded and convergent parallel mixed method study designs (Figure 3; Creswell & Plano Clark, 2011, pp. 69-70). A concurrent design allows different methods to be prioritized equally (Creswell & Plano Clark, 2011, pp. 70-71). Triangulation of data "seeks convergence, corroboration, and correspondence of results from different methods" (Greene, Caracelli, & Graham, 1989, p. 259) through the analysis of "different but complementary data on the same topic" (Morse, 1991, p. 122) to assist the development of a full understanding of the phenomenon being researched. The use of an embedded design positions appropriate qualitative data as a supplement to the quantitative data. It enhances the quantitative data (Creswell & Plano Clark, 2011, p. 72) by providing participants with an opportunity to elaborate on the learning experiences they record. The convergent parallel design also facilitates understanding of the phenomenon being investigated by keeping the strands separate during the

initial analysis but allowing mixing of the results during the overall analysis and interpretation (Creswell & Plano Clark, 2011, pp. 70-71).

This study used both quantitative categorical survey data and qualitative data to identify patterns and linkages to elaborate the 'apprenticeship' in medicine. Firstly, a qualitative data collection strand was embedded within a quantitative survey to allow participants to elaborate on the learning experiences identified in their quantitative responses. This collective data strand was analyzed. Secondly, using a convergent parallel design this collective strand was then merged with analyzed qualitative semi-structured interview response data (Figure 3) to allow a comprehensive analysis of intern learning that occurs in modern hospital settings. This strategy allows comparisons of two or more separate data collection methods for the same research problem and provides some rigour by triangulating the evidence and establishing convergence and/or differences that can broaden the understanding (Creswell, 2009) of how interns learn in the 21st Century. Therefore, much of this work was undertaken simultaneously.

Figure 3: Concurrent Triangulation Design (adapted from Creswell & Plano Clark, 2011, pp. 69-70)



The study was conducted in a large regional hospital in Australia, The Townsville Hospital (TTH). Australian medical interns complete either a four-year postgraduate medical degree or a six-year undergraduate medical degree before being allocated to a hospital to undertake their 47 week full-time equivalent internship (Australian Health Practitioners Regulation Agency, 2015). All terms offered to interns are accredited against National Standards for Internship (Australian Medical Council, 2013). TTH

interns must successfully complete five terms during this internship year to gain General Registration. Intern numbers at TTH have increased substantially from 16 in 2005 to 70 in 2014. Study subjects necessarily needed to have been part of a cohort of interns throughout an entire year to get a good picture of their learning and to produce data that was valid for comparative studies from one clinical rotation to another.

2.1.2 REFLEXIVITY

Data for the first three phases of the study were collected by the doctoral candidate who was a Principal Medical Education Officer (PMEO) with a secondary and adult education background rather than a medical or health related background. This background provided theoretical knowledge to be able to analyze learning without influencing the specific learning that occurred in clinical settings during the medical apprenticeships.

2.1.3 DATA COLLECTION

This study was essentially an exploration of the 'apprenticeship' in medicine and it has used both quantitative categorical survey data and qualitative data to identify patterns and linkages to elaborate the learning that occurs during the internship year. This mixed methods study was considered the best way to understand the lived experiences of ‘masters’ as they supervise their ‘apprentices’ in gaining medical competencies, and interns as they move through their ‘apprenticeship’.

There were three data collection phases to this study (Table 2);

1. The development and trial of a tool to capture the learning that occurs in the first week of interns’ rotations and the development and trial of semi-structured interview guides for both interns and supervisors to determine how medical apprenticeships do, and should, work.
2. An investigation of interns’ learning in the work setting using an electronic tool to describe learning during the first case of the day, combined with a reflective diary. This was used to determine the current relevance of the apprenticeship model of learning.

3. A qualitative investigation of both intern and supervisor perceptions of how interns learn and what drives this learning through conducting and analyzing semi-structured interviews.

Table 2: Overview of the three phases of data collection for the study

Phases	Study sub-question	Timeline	Subjects	Sample size	Data collected
1a. Development of tools – "First case of the day"	1. Do interns still learn via an apprenticeship model of learning? 2. How does the medical apprenticeship work? a. What do medical interns learn in their apprenticeship? b. Where does learning occur in a medical apprenticeship?	Term 3, 2012 Pilot Week 1, Term 5 2012	Interns undertaking Medicine, Surgery & ED	Reference group: n = 18 interns	Definition of items used in tool using modified Delphi technique.
1b. Development of tools – Semi-structured interview guide	1. How does the medical apprenticeship work? 2. What drives interns to learn the way they do?	Terms 1 & 3, 2013	Reference group interns & supervisors not taking part in the study proper.	Interns: n = 3 Supervisors: n = 2	Transcripts of semi-structured interviews
2. Quantitative survey & journaled reflections of learning – "First case of the day"	1. Do interns still learn via an apprenticeship model of learning? 2. How does the medical apprenticeship work? a. What do medical interns learn in their apprenticeship? b. Where does learning occur in a medical apprenticeship?	Data collection from Term 1 2013 – Term 5 2014	Medical interns	2013: n = 40 2014: n = 48	1 case per day x 5 days x 5 terms x minimum 15 interns/year x 2 cohorts = learning from 750 case records
3a. Qualitative semi-structured interviews with interns	1. Do interns still learn via an apprenticeship model of learning? 2. How does the medical apprenticeship work? 3. What drives interns to learn the way they do?	Term 5 2013 & Term 5 2014	Same interns as Phase 2	2013: n = 16 2014: n = 4	Transcripts of semi-structured interviews
3b. Qualitative semi-structured interviews with supervisors	1. Do interns still learn via an apprenticeship model of learning? 2. How does the medical apprenticeship work? 3. What drives interns to learn the way they do?	Between Term 4 2013 & Term 3 2015	Supervisors of interns in Phase 2	Consultants: n = 12 Registrars: n = 6	Transcripts of semi-structured interviews

2.2 ETHICS

A low risk ethics application for all phases of the study was approved by The Townsville Hospital Human Research Ethics Committee (HREC) (HREC/12/QTHS/115) on the 27th July 2012. Approval from The Townsville Hospital's Research Governance Officer was granted on 26th September 2012 (SSA/12/QTHS/155). A further low risk ethics application was approved by James Cook University HREC on 19th October 2012 (H4827).

2.3 PHASE 1A - DEVELOPMENT AND TESTING A TOOL TO CAPTURE INTERNS' LEARNING

The quantitative component of this study involved collecting data from TTH interns to determine the degree to which they learn via an apprenticeship model of learning. Further, it was important to understand how the medical apprenticeship worked, what medical interns felt they learnt in their apprenticeship, as well as where and when this learning occurred. This required the development of a data collection tool in the form of an online survey. The design brief for the tool included a qualitative component in the form of a journal, where interns had the opportunity to elaborate on their learning experiences.

2.3.1 DEVELOPMENT OF A TOOL

A data collection tool was developed to provide interns with a reflection checklist to record their learning. The initial draft tool was developed as a two-step data entry paper-based survey.

1. Most of the existing literature reported intern clinical activities and tasks rather than identifying the learning that occurred from undertaking these activities and tasks; they were more time and motion studies than studies of the interns' learning. Using ideas from these lists found in the literature (Dent et al., 2006; Derrick et al., 2006; Eraut, 2004; Westbrook et al., 2008; Zhu et al., 2008) and some additional original items, a checklist that focused on specific individual learning activities rather than generalized learning or work tasks was developed.

2. Wilkinson and Sheehan's (2011) framework of "concrete tasks", "project management", and "identity formation" was used to organize the learning activities or 'learnt items'. However, these terms were modified to provide interns in this study with categories that were easily identifiable with their everyday tasks: 'Content' learnt items (e.g. clinical knowledge, patient's history, how to consent patient) became the list of concrete tasks; 'Administration' learnt items (e.g. how to write up patient charts/notes, how to access X-rays) became the project management tasks required to make the clinical work progress; 'Professional Identity' learnt items expanded on the concept of identity formation to encapsulate professionalism, culture and motivation in clinical environments and included what to do to look professional, who to trust/who not to trust, and how to work more efficiently (Appendix 1).
3. The second step of the developed tool required interns to identify where they were (their physical location), from whom or from where they learnt each new piece of knowledge and how that learning occurred (Appendix 2).

In June of 2012, this draft tool was reviewed by a research assistant (an intern) to explore the feasibility of the proposed method of data collection prior to the submission of ethics applications. This research assistant also explored the usability and comprehensiveness of the tool from the perspective of an intern, by recording their learning during the first week of a new rotation. Based on the feedback from the research assistant, the only changes made involved the movement of two items from one category to another.

2.3.2 TRANSLATION OF THE TOOL TO AN ELECTRONIC APPLICATION ('APP')

The interns' key role in a hospital is service provision; they are busy clinicians, albeit under supervision. In participating in this study, there were added expectations. It was essential that these added tasks be made as easy as possible to increase the likelihood of interns' participation. With the help of TTH's Information Division, the checklists outlined above in Section 2.3.1 of this thesis chapter were therefore translated into an electronic application or 'app' called the "PGMEU Learning Survey" (PGMEU stands for Postgraduate Medical Education Unit), with Logon and Menu pages (Appendices 3 & 4). Entering data on the 'app' consisted of three steps:

- In Step 1, a date was generated automatically, or a date could be chosen from a calendar and a drop-down box was provided for identification of the rotation

the intern was undertaking (Appendix 5). An open field box requested a case descriptor such as information about the case, but nothing particularly identifying. Case descriptors could be something like "72-year-old male with cellulitis" or "27-year-old female with PE". Initially, this step also included a field for describing the general location of where the user was when they learnt the things that they identify e.g. at the bedside or via a corridor conversation with a colleague afterwards. This feature was moved to Step 2 prior to the start of the trial pilot.

- Step 2 was divided into the three sections of Content, Administration and Professional Identity, with each of the individual items from Appendix 1 created as separate check boxes (Appendix 6). In this step, users were required to think about what they learnt in each of these three areas with Content to be thought of as new professional knowledge, Administration as paperwork and organization, and Professional Identity as the development of their own professional identity. As indicated in the previous point, there was also the open field for identification of location for *each* learnt item.
- In Step 3, all checked boxes from Step 2 and the identified locations were pre-populated into Step 3 (Appendix 7). By clicking on the individual lines under Content, Administration and/or Professional Identity Learnt items, information in the "How I learnt" section became available for checking.

An additional function was added as an optional step. When "Finish" was clicked at the end of Step 3, the user was taken to the "Manage Journal Entries" page (Appendix 8). This provided an opportunity for the user to clarify, expand and/or add to their learning reflections.

The electronic application also had a number of functions available for the 'Administrator' of the tool (Appendix 9). These include managing the various components of the tool, managing users, managing surveys and managing journal entries. Due to system restrictions, the draft online 'app' was only accessible from the Queensland Health Intranet during the pilot phase of the study. This meant that the interns had to be on a computer connected to the hospital server to input data.

2.3.3 REFINEMENT OF THE TOOL USING A MODIFIED DELPHI TECHNIQUE

Following development of the online app, it was necessary to assess the validity and usability of the data collection tool. At the end of September 2012, interns were invited to participate as members of a reference group. Eighteen volunteer interns (average age 30.3, range 23 - 57) were provided with an information sheet and consent form to participate (Appendices 10, 11 & 12). The first part of the volunteers' involvement required direct communication with the principal researcher via email; anonymity for this part of the study was therefore not possible. The reference group assisted in the refinement of the lists of learning activities via a modified Delphi technique (Brooks, 1979), to produce the final tool for the next stage of the study. This was an iterative process where access to the draft online 'app' was sent out to the 'reference group' who then reviewed and provided feedback on the draft tool. The reference group was asked to scrutinize each of the check boxes in the survey (Appendix 13) and consider the following in providing feedback:

- What items didn't make sense?
- What items needed to be moved? To where?
- What needed to be removed?
- What needed to be added?
- How useable were the four steps to the survey?
- Any other comments/suggestions/recommendations?

As a result of the feedback provided by the reference group interns, a number of minor changes were made to the draft. The new draft was once again then sent out to the reference group for further feedback (example of communique in Appendix 14). This process was repeated until consensus was reached (a total of three rounds). The resulting checklist consisted of 26 'content' learnt items, 30 'administration' learnt items, and 28 'professional identity' learnt items. These learnt items were all translated into the online learning reflection survey application, now called the '*LRS app'* which stands for Learning Reflection Survey application.

2.3.4 PILOTING THE TOOL

A pilot study using the final draft of the '*LRS app'* was conducted in week 1 of Term 5 2012 (12th – 16th November) using the reference group as participants. Two of the reference group members chose not to participate in this pilot, leaving 16 to take part. The purpose of this pilot was to allow refinement of processes including acceptability,

usability, data extraction, manipulation, analysis and reporting to answer the study questions. The data collected in the pilot was not intended to be used in the analysis of the study proper for a number of reasons; the interns who participated in the pilot were also the reference group interns who assisted with the development of the tool itself, therefore including this data would have added bias into the study; the number of subjects participating in the pilot was very small and therefore did not provide data that could be considered generalizable.

2.3.4.1 MAINTAINING ANONYMITY

To maintain anonymity of users during the data collection phase of the study, a system was developed and tested by the reference group members during the pilot phase. Users were asked to develop a unique identifier as a 'Username'. The formula for the 'Username' was 'M' for male or 'F' for female, followed by the User's mother's maiden name, followed by their own age. For example, a 21-year-old female user whose Mother's maiden name was Sample would be FSample21. Members of the reference group were asked to phone through this username to an office phone, without identifying themselves in any other way. All users were initially given the password 'changeme' to access the survey, which they could then change once they were logged on to the app. Anonymity of the reference group members was therefore maintained throughout this phase of the study.

2.3.4.2 PILOT DATA COLLECTION

Participating reference group members were asked to use the online learning survey 'app' to record their learning while managing the first case of each day of the first week of the term. The rationale for this was the assumption that more learning would occur during the first week of each term than at any other period of the term; in addition to clinical work on the new rotation, interns are required to learn about new places, personnel and processes. Further, the first case of the day was chosen as the focus case for each of those days because:

- it was more likely that interns would remember this case with a fresh mind at the start of the day; and
- interns would be more likely to complete the management of this case than any other case during the day.

Instructions emailed to the reference group can be found in Appendix 15. For interns working in medicine, surgery and elective terms, five cases were recorded during the

week, while those interns working 10 hour shifts in emergency recorded only four cases for the term. Interns were also asked to use the journal section of the online tool if possible, to test the functionality of this part of the tool.

2.3.4.3 PILOT DATA ANALYSIS

The app provided opportunities for interns to reflect on their learning in the core rotations of medicine, surgery and emergency medicine, plus elective terms that occurred in 'Other' units such as non-core TTH unit, non-core community-based unit, small hospital (rural hospitals) and GP (General Practice via the Prevocational General Practice Pathways Program – PGPPP).

All the interns' responses were recorded in a database behind the 'app'. It is important to note that learning experiences did not necessarily include responses in all the categories of content, administration or professional identity; data recorded was dependent on the specifics of the learning experience of individual interns. This method of data collection allowed counts of responses within the various nominal variable categories.

Data generated within the learning survey 'app' was downloaded as a .csv (comma-separated values) file, which is essentially a format used to store spreadsheet or database data. This was then converted to an Excel file for analysis. Lines and columns of the quantitative data were sorted and counted multiple times to determine if the *LRS app* generated data that could be used for comparative analyses.

Qualitative 'journal entries' were downloaded from the learning survey 'app' as a .csv file before being converted to an Excel file. The data were examined to analyze the functionality of this part of the survey and to determine if the responses given would enhance the quantitative data as anticipated.

2.3.5 ANALYSIS OF THE TOOL

An overall analysis of the tool was undertaken to determine if further refinements were required. There was one Step 2 check item that had been duplicated and this was easily removed. A drop-down menu called "Physical location where this item was learnt" was also added to this step to improve the functionality of the data collection.

In terms of the overall functionality, the most significant modification was to move the hosting of the electronic learning survey to an Internet server (http://pgmeu-survey.townsvillehospital.com/Account/LogOn). This move made the survey accessible outside of the hospital's intranet and facilitated data collection at times when interns were not working. The only other change to the tool's functionality was to include a separate download feature for journal entries. These changes were made by the TTH Information Division.

Verbal feedback from the reference group suggested that a user's manual would assist interns in using the *LRS app*. This was developed (Appendix 16) and feedback was sought from the reference group to ensure that the manual was 'user-friendly'.

2.4 PHASE 1B – DEVELOPMENT AND TRIAL OF SEMI-STRUCTURED INTERVIEW GUIDES FOR BOTH INTERNS AND THEIR SUPERVISORS

The qualitative component of this study also required the development of a data collection tool in the form of an interview guide. This guide needed to be designed to collect information about intern and supervisor perceptions of how the medical apprenticeship works and what drives interns to learn the way they do.

2.4.1 PILOT INTERN INTERVIEWS

A separate guide to interview interns was developed and piloted. To further investigate the 'apprenticeship' in medicine, the questions were designed to explore intern perceptions of the medical apprenticeship and attempted to gain an understanding of what motivated them to learn.

2.4.1.1 DEVELOPMENT AND PILOT OF INTERN INTERVIEWS

An interview guide for a 20 – 30 minute semi-structured interview with participating interns was developed (Appendix 17). Reference group interns who had completed their learning reflections via the learning survey 'app' (N = 3) were invited to participate in the pilot of the semi-structured interview to explore:

- how they thought they learnt;

- what they thought the roles of the registrars and consultants were in their learning;
- what they thought the main drivers of their learning were as they worked and learnt on the job;
- what the ideal learning situation would be in their internship;
- how important they thought it was to learn things around content, administration and professional identity and which was the most important of these three; and
- their perceptions of a 'medical apprenticeship' and how they thought it worked.

Interviews were recorded using a Phillips digital voice recorder. Interviews were transcribed verbatim by the researcher.

2.4.1.2 PILOT DATA ANALYSIS

The first cycle of coding was completed using the 'Comments' feature in Word. 'Values coding', which Saldana (2013) describes as an ideal method of individuals reflecting on values, attitudes and beliefs about their experiences, was used for the first cycle of coding. Values coding was developed by Gable & Wolf (1993) to identify intrapersonal and interpersonal experiences of the subjects being interviewed and is ideal for exploring phenomenon such as how the medical apprenticeship works. Saldana (2013, p. 111) defines an 'attitude' as "the way we think and feel about ourselves, another person, thing or idea", a 'belief' as "part of a system that includes our values and attitudes, plus our personal knowledge, experiences, opinions, prejudices, morals, and other interpretive perceptions of the social world", and a 'value' as "the importance we attribute to oneself, another person, thing or idea".

A macro called "Extract comments to new document" (The Doc Tools, 2006) which was downloaded from the Internet, was used to transform the Word comments (values codes) from the analysed transcripts into a table (also in Word). Codes allocated to each question were collated together for the second stage of coding and final identification of themes.

Saldana (2013) indicated that it is not necessary to identify all three types of codes in the transcripts, nor is it essential to differentiate between them (p. 111). Saldana also pointed out that identifying the type of values code to be attributed to a participant statement "can sometimes be a slippery task" (p. 111). To reduce this inherent arbitrary nature of values coding, all the pilot interview documents were sent to one of the

supervisors for review of both the process and the results. Further code checking was performed via the principal researcher and another of the supervisors comparing independent *NVivo* analyses of the transcripts and then cross-checking these with the results generated via the values coding method.

2.4.2 PILOT SUPERVISOR INTERVIEWS

It was important that the questions used in the interviews of the supervisors mirrored those used in the intern interviews so that the responses could be compared. This also assisted in identifying patterns and linkages in the qualitative data that enabled elaboration of the medical apprenticeship. The order in which the questions were asked was explored in a 'debriefing' at the end of the interviews. This was necessary to ensure that the questions posed were in a logical order for supervisors to be able to articulate their perspectives on each topic.

2.4.2.1 DEVELOPMENT AND PILOT OF SUPERVISOR INTERVIEWS

To explore the supervisors' perspectives of the 'apprenticeship' in medicine, a guide for a 20 – 30 minute semi-structured interview with intern supervisors was developed (Appendix 18). Supervisors of interns were invited to participate in the pilot of the semi-structured interview to explore:

- how they thought interns learnt;
- what they thought the role of the registrar and consultant were in interns' learning;
- what they thought the main drivers of intern learning were as they worked and learnt on the job;
- what the ideal learning situation would be for their interns during internship;
- how important they thought it was for interns to learn things around content, administration and professional identity and which was the most important of these three; and
- what their perceptions were of a 'medical apprenticeship' and how it works.

Supervisors (N = 3) were provided with an information sheet and written consent was obtained for interviews to be recorded using a Phillips digital voice recorder (Appendices 19 and 20). Interviews were transcribed verbatim by the researcher.

2.4.2.2 PILOT DATA ANALYSIS

The first cycle of coding was completed using the same methods trialed in the intern pilot study using the 'Comments' feature in Word, and like the intern pilot study, 'values coding' was used to code the data (Gable & Wolf, 1993; Saldana, 2013). The macro "Extract comments to new document" (The Doc Tools, 2006) was again used to translate the comments into a table before the allocated codes to responses for each question were collated for the second stage of coding and final thematic analysis.

The coding team for this study consisted of the principal researcher and three of the supervisors. As values coding was a relatively new method for the coding team, a decision was made to undertake coder triangulation. This also had the additional benefit of reducing coder biases. One full interview transcript was randomly chosen by one of the other coders and this was independently coded by two of the supervisors using inductive coding, while the principal researcher used values coding. A comparative analysis of the values codes and the inductive codes was undertaken to check for consensus and validation of the codes generated by the values coding.

After analysis of the interview debriefing transcripts, it was decided that the order in which the questions were posed during the semi-structured interviews of the supervisors would be as written.

2.5 PHASE 2 - INVESTIGATION OF INTERNS' LEARNING

The second data collection phase of the study involved the collection of quantitative data. It involved interns providing their reflections on what they felt they had learnt while managing the first case of each day during their first week of each new rotation. The data from this part of the study was used to determine the extent to which interns learn via an apprenticeship model of learning. It was also used to gain an understanding of how the medical apprenticeship worked, the specifics of what medical interns learnt in their apprenticeship, as well as where and when this learning occurred.

2.5.1 COLLECTION OF QUANTITATIVE AND QUALITATIVE DATA USING THE SURVEY TOOL

Quantitative and qualitative data were collected using the online survey tool that was

specifically developed and trialed for this purpose, as described in Section 2.3 of this thesis chapter.

2.5.1.1 RECRUITMENT OF PARTICIPANTS

A presentation was made to TTH interns during their orientation week at the beginning of 2013 and 2014 (prior to starting their internship) and an invitation was extended to all interns in each cohort (65 and 70 respectively) to participate in the study. Whilst this convenience sampling risks attributing sampling bias, it was considered a valid method of sampling for this part of the study since all participants are interns and by definition, all are learning during their year of internship and could therefore reflect on that learning.

A total of 40 interns were recruited in 2013 (61.5% of cohort) and 48 were recruited in 2014 (68.6% of cohort). An information sheet was provided to each of these volunteer interns and written consent was obtained for them to participate in the study (Appendices 21 & 22). All interns undertake rotations in medicine, surgery and emergency medicine during their internship. These rotations are called the 'core' or mandatory rotations. Although all interns were required to complete these rotations, the order in which they were completed was not uniform. Nevertheless, some rotations matched, for example, there were a number of interns who undertook emergency medicine in term one, a number in term two and so on, and the sample numbers were large enough to potentially provide a minimum of eight interns recording data in each of the core rotations. However, participating in the study by providing learning reflections was voluntary and it was therefore unrealistic to expect that all interns would provide full data sets. Furthermore, with the data entries being anonymous, there was no way of doing any follow-up work to encourage more complete data sets other than sending out a general email to encourage the interns to provide missing data.

As in the pilot study, interns were asked to develop a unique identifier that was used as a username to maintain their anonymity during the study. For each of the intern cohorts, interns were asked to submit this information anonymously by dropping a given form into a closed box.

2.5.1.2 DATA COLLECTION

Interns recruited to the study were encouraged to use the learning reflection survey, the *LRS app,* to record all their learning that occurred while managing the "first case of

the day" for each of the first five days of all of their rotations, but particularly their medicine, surgery and emergency medicine rotations. Interns were also asked to complete reflections at the end of each of these days using the journal feature of the tool, noting each teaching and learning episode and detailing them as much as possible. Reminder emails were sent out each day to encourage the interns to record their data directly into the *LRS app* (Appendix 23). If this was not possible due to workloads, interns were encouraged to make notes of their first case for each day so that their learning reflections could be accurately recorded 'retrospectively' at a later time. This would also allow the interns time to reflect on their learning in these cases.

As in the pilot study, interns working in medicine, surgery and elective terms recorded five cases for the term, while those working 10 hour shifts in Emergency recorded only four cases for the term.

2.5.2 DATA ANALYSIS

As in the pilot study, all the interns' responses were recorded in a database linked to the *LRS app*. Again, it is important to note that recorded learning experiences did not necessarily include responses in all the categories of content, administration or professional identity; data recorded was entirely dependent on the specifics of the learning experience of individual interns. This method of data collection allowed counts of responses within the various nominal variable categories.

Data generated within the *LRS app* were downloaded as a .csv file (Appendix 24). This was then converted to an Excel file for data analysis. Data provided by the two intern cohorts were amalgamated prior to data analysis, resulting in one set of data for each term. Each entry that was made by an intern within each row of data was given a nominal value of one before rows and columns of the data were sorted and counted multiple times to generate data that was used for further comparative analysis. More specifically, detailed analyses of how recorded learning varied by rotation in terms of location, what was learnt and how it was learnt were conducted.

Standard deviations were calculated where appropriate. The median and interquartile ranges were calculated for the age of the participants.

Where possible, 95% confidence intervals (CI) were calculated using the formula

$$\text{CI} = p \pm 1.96 \sqrt{\frac{p(1-p)}{n}}$$

where p was the proportion attributed to a category and n was the total number of sets of learnt items for that data. To confirm statistical significance, a further calculation was undertaken using the formula:

$$\text{CI} = (p_1 - p_2) \pm 1.96 \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$$

where p_1 and p_2 were the proportions attributed to the two categories of interest and n_1 and n_2 were the total number of learnt items for each data set of those two categories. Statistical significance was confirmed if zero did not lie between the two upper and lower intervals calculated. Further testing for significance was conducted using a Z score calculator for two populations (Stangroom, 2016) to examine the proportions between two sets of data.

Reflective journals that were written by the interns during each of these weeks were also downloaded as .csv files (Appendix 25). As these journal entries were inextricably linked to the quantitative data interns provided as learning reflections, the journal entries were not analyzed for themes but were used to enhance and triangulate the data from the learning reflection checklists.

2.6 PHASE 3 – SEMI-STRUCTURED INTERVIEWS

The qualitative study of the medical apprenticeship was carried out using the piloted semi-structure interview guides (Appendices 17 & 18). The interviews aimed to determine the extent to which interns learn via an apprenticeship model of learning, how the medical apprenticeship works and what drives interns to learn the way they do.

2.6.1 PHASE 3A - QUALITATIVE SEMI-STRUCTURED INTERVIEWS WITH INTERNS

To explore the 'apprenticeship' in medicine from an intern perspective, participant interns from the 2013 and 2014 cohorts at TTH were invited to participate further in

semi-structured interviews. This was an opportunity for member validation to occur (Liamputtong, 2010). Participating interns in each cohort (those interns who entered data on the *LRS app*) were enlisted for this phase, a convenience sample of volunteers (Green & Thorogood, 2009). The number of interns interviewed for each cohort varied depending on when data saturation was reached (2013: n = 16, 2014: n = 4). This represented approximately 25% of the full intern cohort of volunteer participants.

2.6.1.1 DATA COLLECTION

Interviews of the 2013 cohort commenced in Term 1, just six weeks into their internship experience. The questions developed and trialed in the pilot study were used to conduct the semi-structured interviews. Each interview was approximately 20 - 30 minutes in length. Interviews were recorded using a Phillips digital voice recorder. The number of interviews carried out was to be determined by the reaching of data saturation. However, after just five of these interviews had been completed, it became clear from the responses that the timing of these interviews was far too pre-mature; with interns having little experience on which to reflect, the responses were notably different to the responses recorded during the pilot study. The interview program was abandoned and rescheduled for Term 5 towards the end of their internship experience. The interviews that were recorded in Term 1 were not used in the analysis of the qualitative data.

Interviews of the 2014 cohort were completed in Term 5 using the same methods as for the 2013 cohort.

2.6.1.2 DATA ANALYSIS

Intern interviews were treated and analyzed using the piloted methods described in Chapter 2, Section 2.4.1. The coding team consisted of the principal researcher and supervisors of this study. The principal researcher conducted an initial analysis of the transcripts using values coding. As values coding was a relatively new method for the coding team and to increase the trustworthiness of the findings, a decision was made to undertake coder triangulation. This was achieved by one of the other coders randomly choosing two full interview transcripts that were then independently coded by two of the coding team using inductive coding. These two interview transcripts provided a range of interns' experiences and comments from which an analysis of the values codes and the inductive codes was undertaken to check for consensus and validation of the codes generated by the values coding.

Further analysis for themes was conducted by the principal researcher, with other members of the coding team functioning as auditors of the analyses until a consensus was reached.

2.6.2 PHASE 3B - QUALITATIVE SEMI-STRUCTURED INTERVIEWS WITH SUPERVISORS

To explore the 'apprenticeship' in medicine from a supervisor's perspective, consultants and registrars who had been supervisors of interns in 2013 and 2014 at TTH were invited to participate in semi-structured interviews. Each participant was provided with an information sheet and completed a consent form to participate in the study (Appendices 26 & 27).

2.6.2.1 DATA COLLECTION

The questions developed and trialed in the pilot study were used to conduct the semi-structured interviews. The interviews were conducted at the hospital by the principal researcher between August 2013 and July 2015. Each interview was approximately 20 - 30 minutes in length and was audio-recorded with the participants' consent. Interviews were undertaken until data saturation was reached (N = 18, 12 consultants plus 6 registrars).

2.6.2.2 DATA ANALYSIS

Interviews were transcribed verbatim. The same process used for the treatment of intern interviews as described in Chapter 2, Section 2.6.1.2, was used to code, extract and analyze the transcripts of supervisor interviews.

Coder triangulation was carried out on a supervisor transcript at the same time as coder triangulation was carried out on intern interview transcripts. All interview transcripts were analyzed by the principal researcher using values coding and then one randomly chosen supervisors' full interview transcript was independently coded by two of the co-researcher coders using inductive coding. A comparative analysis of the values codes and the inductive codes was undertaken to check for consensus and validation of the codes generated by the values coding of the supervisors' interview transcripts.

2.6.3 SECOND CYCLE OF QUALITATIVE DATA ANALYSIS

A second cycle of qualitative data analysis was conducted to filter and focus the salient features of the data, as described by Saldana (2013, p. 8), to identify themes. The values coding generated from the intern and supervisor interviews were combined before a deductive descriptive analysis for themes was conducted by the principal researcher. Other members of the coding team functioned as auditors of the analyses until consensus was reached.

2.7 TRIANGULATION OF DATA

This mixed methods study was undertaken to determine how interns currently learn. It was important to gain an understanding of exactly how the medical apprenticeship works from both pragmatic and philosophical standpoints. To achieve this, it was essential to combine the interns' self-reported quantitative learning reflections, their self-reported elaborations of their learning expressed in journal entries and their perceptions of how a medical apprenticeship works (Figure 3).

More specifically, the self-reported quantitative data has been summarized using simple univariate and bivariate descriptive statistics to highlight important sources of learning for interns. The qualitative data from the intern journal entries were used as examples of this learning. The data generated via the online *LRS app* has been compared with the interns' perceptions of how they learn within an apprenticeship learning relationship, as expressed in the semi-structured interviews. The interns' data were also compared with the supervisors' perceptions of how a medical apprenticeship works and collectively, these data were used to determine from whom or from what interns learnt and what specifically they did learn via these encounters, as well as determining to what degree interns still learnt via an apprenticeship model and how much of an intern's learning was self-directed.

This chapter described the methodology and methods used in this study. The next chapter focuses on the results and analysis of the pilot studies conducted.

CHAPTER 3 – RESULTS OF PILOTS

3.1 INTRODUCTION

The previous chapter outlined the methodology used for this study. This chapter details the results of the first data collection phase of this study, the development and trial of the tools to be used to gather data for this study. All other results are contained in following chapters.

The *LRS app* provided opportunities for interns to reflect on their learning in core rotations of medicine, surgery and emergency medicine, plus elective terms such as non-core TTH unit, non-core community-based unit, small hospitals (rural hospitals) and GP. While the pilot data presented in this chapter concentrates on the core rotations only, results in the following chapters will report on all learning reflection data.

3.2 PHASE 1A – PILOT *LRS APP* DATA ANALYSIS

Of the 18-member reference group, 16 volunteers consisting of nine males and seven females with average age 29.8 (range 23 – 57) participated in the pilot study. These interns recorded 585 learning experiences during the management of the "First case of the day" each day of the first week of their Term 5 rotation (surgery n = 6, medicine n = 6, emergency medicine n = 4).

One member of the reference group did not participate in the pilot and the single intern undertaking the medical sub-specialty was also excluded from the pilot data analysis as the learning reflections of a single intern would be less likely to be transferrable to other interns.

3.2.1 EXPLORATORY ANALYSIS

This study aimed to investigate several different aspects of interns' learning experiences. For example, the *LRS app* survey tool was designed in a way that learning in each rotation and comparisons of learning between rotations could be investigated. The tool was also designed in a way that would allow investigation of the specifics of what and how interns learnt e.g. whether interns learnt more via an apprenticeship relationship or via self-directed means. For this reason, pilot data were manipulated using Excel to investigate if the *LRS app* was capable of generating data

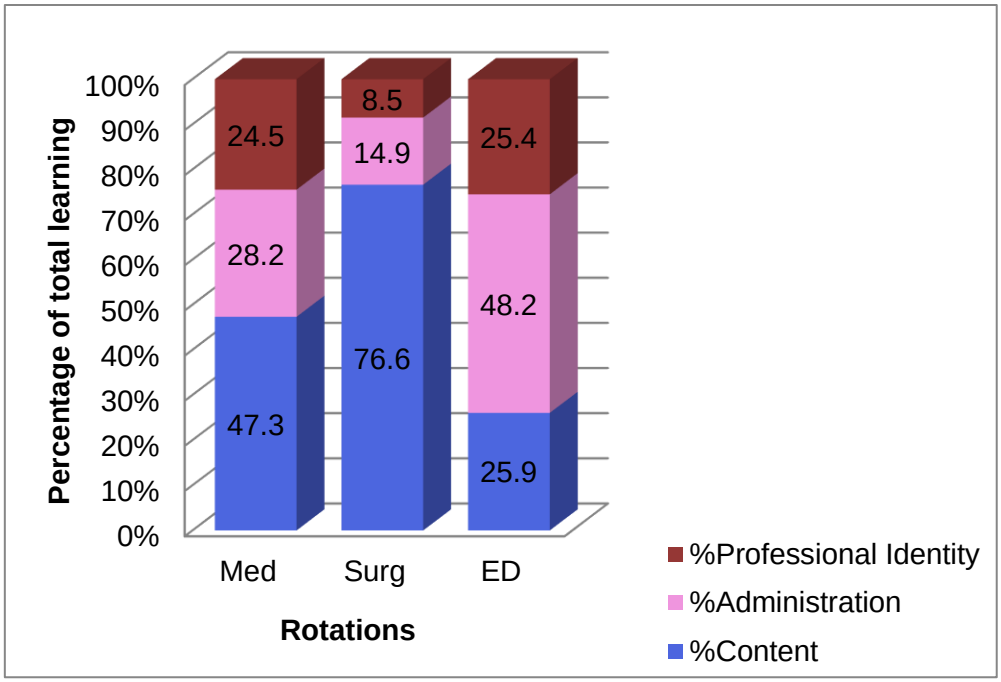
that enabled learning reflections to be analyzed from a number of perspectives as described in the aim of the study. Below are examples of the results of data manipulation.

1. Comparison between rotations/specialties

There is a perception that the learning that occurs in different rotations/specialties is somehow different. It was therefore important to be able to compare intern perceptions of that they learnt in different rotations/specialties to determine if this was in fact true; this may have implications for what rotations interns should be allocated.

Pilot data enabled an analysis of intern perceptions of their learning. For example, intern perceptions of learning in surgery (Surg; n = 94 responses) were predominantly around content (content 76.6%; administration 14.9%; professional identity 8.5% (Figure 4). Intern perceptions of learning in medicine (Med; n = 298 responses) were also predominantly around content, though less than surgery (content 47.3%; administration 28.2%; professional identity 24.5%). Intern perceptions of learning in emergency medicine (ED; n = 193 responses) were predominantly around administration (content 25.9%; administration 48.2%; professional identity 25.4%).

Figure 4: An example of possible data analysis - Comparison of learning in the core rotations



2. Differences within rotations

The *LRS app* was designed to generate data that studies differences within rotations such as gender differences and changes in approaches to learning over time as interns gain more experience. For example, in the pilot, females in medicine reported their perceptions of learning as consisting of 9.4% more content learning experiences than males, and females in surgery and emergency reported more administrative learning experiences than males (8.3% and 9.4% more respectively).

3. Specifics of intern learning

From whom interns learn

The main aim of this study was to identify the specifics of intern learning as there is currently a dearth of literature on this topic. It was therefore essential for the *LRS app* to be able to capture intern perceptions of their learning from which the specifics of their learning could be extracted.

Several pilot responses (8%) had incomplete data entries in this area of the survey, however data collected can be manipulated to determine from whom interns learn. For example, pilot data showed that the predominant method by which participating interns perceived they learnt was via an apprenticeship model of learning (60.6%), with 17.5% and 43.1% of learning occurring from interactions with the consultants and registrars respectively. Self-directed learning occurred via application of previous knowledge (23.2%); from their peers – other junior doctors (7.1%); nurses (3.5%); use of other resources such as UpToDate, CKN (Clinicians Knowledge Network), Google (3.5%); the patient or patient's family (1.1%) and; allied health practitioners including pharmacists (0.9%).

Further manipulation of data allowed differences in methods of learning through the various rotations to be noted, with most learning in medicine and surgery being via apprenticeship learning, and via self-directed learning (SDL) in emergency medicine (Figure 5 & 6).

Figure 5: An example of possible data analysis - Interns' learning via apprenticeship relationships & self-directed learning

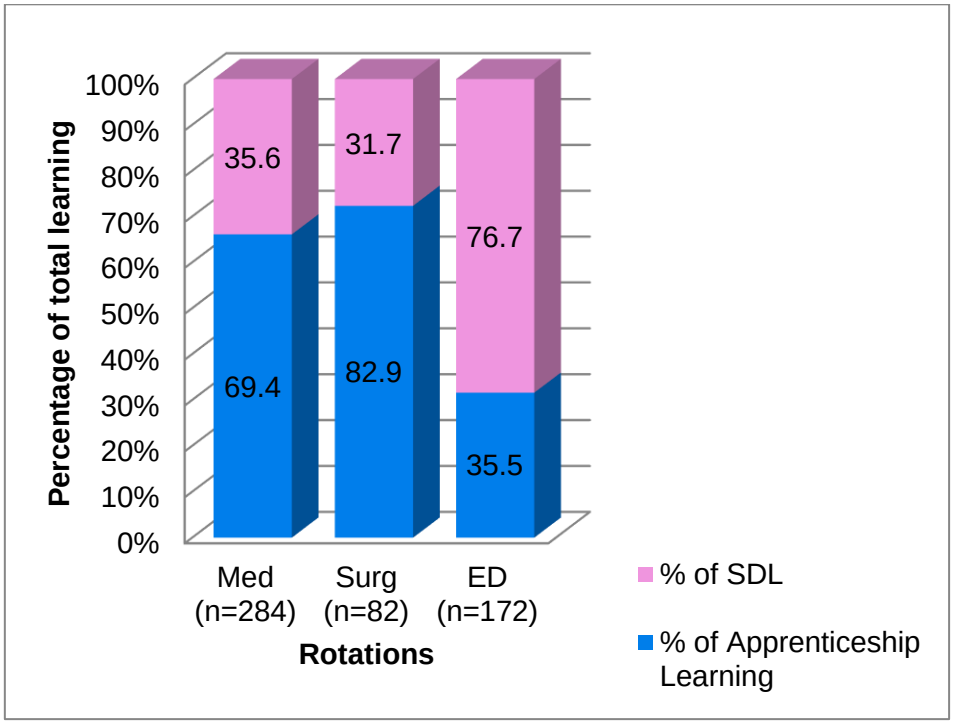
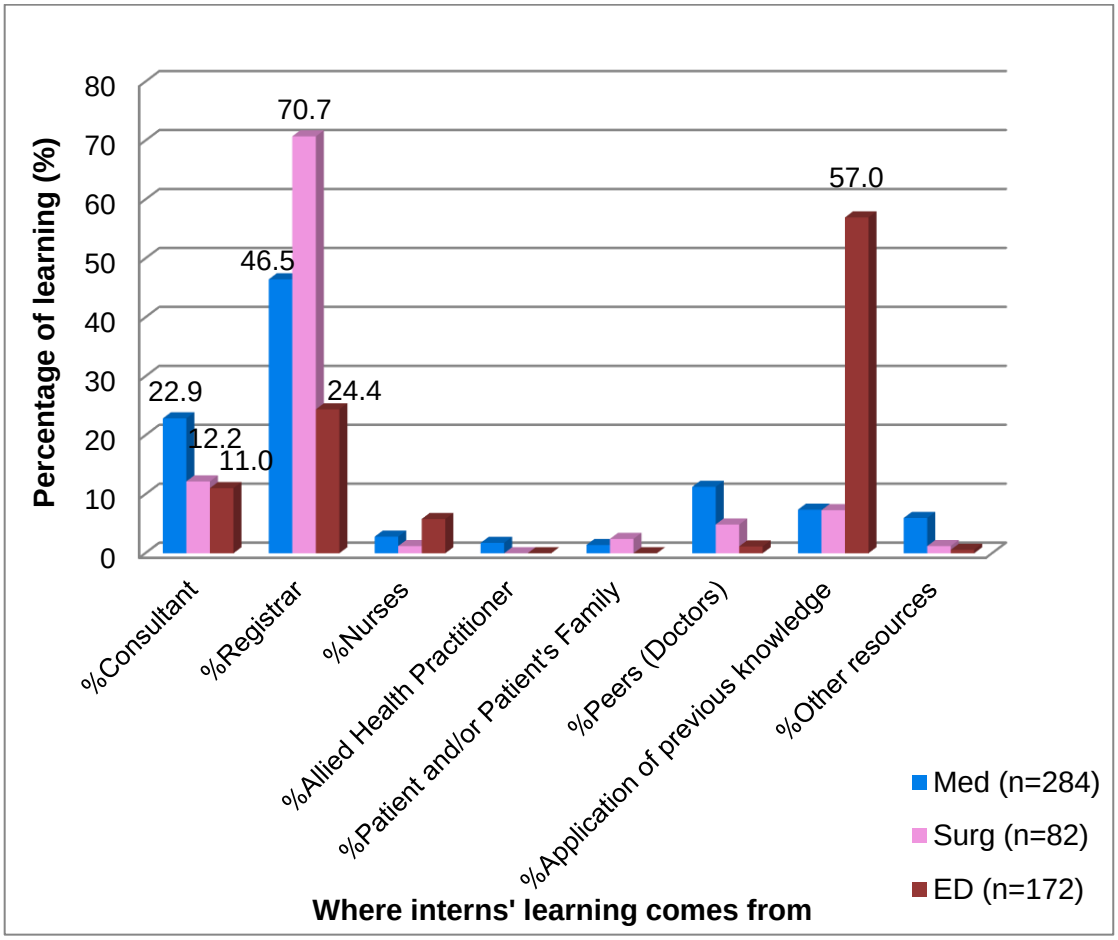


Figure 6: An example of possible data analysis - Interns' learning



What interns learnt

The *LRS app* provided a variety of options to investigate the specifics of what interns learnt. Analysis can show the top three items reported as learnt by interns in terms of content, administration and professional identity. The *LRS app* is versatile in that it can also stratify the data into rotations. For example, there was a difference in what interns participating in the pilot reported that they had learnt in each rotation (Table 3).

Table 3: An example of possible data analysis – Comparison of what interns learnt in each rotation.

Rotation	Emergency		Medicine		Surgery	
	Learnt item	% of category total	Learnt item	% of category total	Learnt item	% of category total
Content	How to examine patient	13.8	Patient History	14.9	New procedural skill	23.6
	Patient History	13.8	Clinical knowledge	12.8	Medication dosage	9.7
	Clinical knowledge	9.6	How to examine patient	9.9	Correct medication to prescribe	8.3
Administration	Where to find forms/paperwork	16.0	How to communicate with other health professionals	14.3	How to consent patient	57.1
	How to write up patient charts/notes	12.0	How to write up patient charts/notes	9.5	How to communicate with other health professionals	14.3
	How to communicate with other health professionals	10.0	Who the appropriate people are to contact	9.5	Where to find forms/paperwork	14.3
Professional Identity	My scope of practice	12.2	How to work in a team	23.3	How to improve my practice	25.0
	When to ask for help	12.2	What to do to look professional	11.0	How to prioritize	25.0
	How to work in a team	10.2	How to say or do something so I look professional	9.6	How to reason out differentials	12.5

Why interns learn the way that they do

The interns' learning reflections collected in this pilot study demonstrated that the journal part of the *LRS app* was functional in providing usable data for analysis. The journal entries (N = 70) made by the 16 interns showed that some extrapolation of the learning can occur and that they can also provide some insight into the motivations for particular modes of learning. For example, in extrapolating the learnt item 'Who to talk to/not to talk to' for professional identity, an intern made the following journal entry;

> *Today's first case clearly established the hierarchy of the team and who makes the decisions. This case also established the hierarchy in the sense of to whom I should direct my questions. (MPotter29)*

How (the methods) of interns' learning

Manipulation of the data entered into the *LRS app* enables an analysis of the methods of interns' learning to be conducted. For example, in emergency medicine, interns

learnt through both consultants and registrars ‘assisting [them]’. In medicine, interns learnt from the consultant by ‘listening to them’ and through ‘demonstration’ from the registrar. Lastly in surgery, interns learnt via the consultants and registrars ‘telling [them] what to do’. Universally, interns learnt from nurses when they ‘showed [them] how to do things’.

3.2.2 ANALYSIS OF THE TOOL

The feedback overall from the reference group was that the actual tool was very quick and easy to use and provided a unique opportunity to consider their learning in a way that they never had before.

However, though the *LRS app* was considered intuitive and easy to use overall, the interns piloting the ‘app’ commented about their inability to reflect on their learning at times that suited them; the ‘app’ was only available via the hospital’s server (Intranet) rather than the Internet (World Wide Web), therefore requiring the interns to be at work in order to enter data. This evaluation was used to secure an Internet URL for the larger study.

3.2.3 SUMMARY

The pilot phase of the study enabled the *LRS app* to be successfully tested for functionality as a survey tool. Data collected from the pilot was easily understood and manipulated using simple software packages. The pilot study demonstrated that the *LRS app* was capable of providing information that could be used to determine from whom or what interns learn, the specifics of what they learn and how, where they are when this learning occurred and the timing of this learning (in which term learning occurred).

3.3 PHASE 1B – PILOT INTERVIEW DATA ANALYSIS

Most of the qualitative data generated for this study were via semi-structured interviews. The pilot of the interview guide was necessary to ensure that the questions asked generated responses that were codifiable and analyzable for themes. The

analysis of the use of ‘values coding’ was also important to ensure that interview responses could provide answers to the questions posed in this study.

3.3.1 EXPLORATORY ANALYSIS

The values codes and themes generated in the analysis of the intern and supervisor pilot interviews by the principal researcher were compared with the inductive analysis codes and themes generated via manual coding of the transcripts by three supervisors. Constant comparative analysis consisting of renaming, reorganization and redefining of the codes was then used to facilitate the development of emerging themes (Green & Thorogood, 2009). There was also a comparison made between the values codes and the *NVivo* cluster, tag cloud and tree mapping analyses generated by the one of the co-researchers. There was some consensus, though there were also a number of suggestions from each researcher for different sub-headings or how some data might be ‘grouped together’ or defined more. The principal researcher used these suggestions to complete a final thematic analysis.

3.3.2 SUMMARY

Analysis of the interview responses showed that questions in the interview guide generated responses that were codifiable and analyzable for themes. The analysis of the use of ‘values coding’ showed that interview responses could provide answers to the questions posed in this study. Consequently, the decision was made to use the interview guide as written and to use values coding as a way of analyzing the qualitative data generated by the intern and supervisor interviews.

This chapter presented the results of the pilots which were administered prior to the commencement of data collection for the study. As outlined in Chapter 2, Section 2.1.1, a concurrent triangulation mixed methods design consisting of a combination of embedded and convergent parallel mixed method study designs (Figure 3; Creswell & Plano Clark, 2011, pp. 69-70) was used for this study. The following chapters present the results of the study; Chapter 4 will present the results of the data collected via the *LRS app* (the quantitative data and embedded qualitative journal entries); Chapter 5 will present the identified themes from the semi-structured interviews; and Chapter 6 will present an interpretation of the merged results of these two data sets (Figure 3).

CHAPTER 4 – INTERNS' LEARNING SURVEY

4.1 INTRODUCTION TO PHASE 2 – INVESTIGATION OF INTERNS' LEARNING

The second phase of this study involved collecting data using the *LRS app*. This phase of the study essentially collected all the quantitative data of the study, with interns providing their reflections on the learning they experienced whilst managing the first case of each of the shifts in the first week of each term. The results of this phase will be presented in this chapter.

As described in Section 2.5.1, learning reflection data were recorded anonymously by individual interns via a series of checklists on the *LRS app* (quantitative data), and some interns also provided further elaboration of their learning experience by making journal entries (qualitative data) via the last step of the *LRS app*. These qualitative data were used to assist in defining interns' learning.

The first section of this thesis chapter summarizes the demographics of the participants and provides an account of the amount of data collected including how many cases interns reflected on and how many learnt items they recorded. The subsequent sections of this thesis chapter present the main findings of the phase 2 data collection for this study in the investigation of interns' learning.

4.1.1 PARTICIPATION

A total of 61 of the 88 interns who volunteered to provide their learning reflections participated in the study. This represents 45% of the 2013 and 2014 intern cohorts at TTH. Analysis showed that 72.5% of the 2013 volunteers (18 female, 11 male) and 66.7% of the 2014 volunteers (21 female, 11 male) provided data at some point in the study (Table 4). The gender mix in the study was representative of the makeup of the full cohorts at this hospital. The median age of the study participants was 24 (IQR 4). Participants of the study signed up for the full year, so the ages of participants did not vary across terms. In the recording of their unique identifiers, one male intern's username indicated he was only 21 years of age. However, at one point during the internship, this intern identified themselves to the principal researcher and disclosed that he was in fact much older. The demographic data for this intern was amended to reflect his real age at the time so that the results were not distorted. Data generated by this intern were maintained as part of the cohort data and therefore not treated differently in the data analysis process.

As outlined in Section 2.5.2, data from both intern cohorts were amalgamated prior to data analysis, resulting in one set of data for each term (Table 4). Interns did not necessarily provide learning reflections for each of their rotations. This can be clearly seen in the participation data provided below. However, there were still 7790 learnt items identified in learning reflections from 636 cases and 488 journal entries provided by the interns as they reflected on their learning while managing their first case of each shift during the first week of each term.

Table 4: Intern participation in the study each term

Basic Statistics	Term 1	Term 2	Term 3	Term 4	Term 5	Total
Number of interns	58	35	26	23	17	**61**
Number of females	37	23	14	13	9	**39**
Total number of cases recorded	227	152	101	91	65	**636**

4.1.2 DATA ANALYSIS

For analysis purposes, data from each year was amalgamated term by term. This was a reasonable thing to do given that all intern terms across Australia are accredited against the national standards for intern training set by the AMC and the Medical Board of Australia (Australian Medical Council, 2013); the accreditation requirements for training result in similarities in interns' learning experiences from one accredited unit to another and from one year to another. For example, all core surgical rotations "must provide supervised experience in caring for patients who together represent a broad range of acute and elective surgical conditions, and exhibit the common features of surgical illness, including the metabolic response to trauma, infection, shock and neoplasia" (Australian Medical Council Limited, 2013, p. 3).

Data entered by interns on twelve of the learnt items (12 lines of data) did not actually contain any data that could be analyzed, so these were removed prior to analysis, that is, the data were cleansed (Table 5). The remaining 7778 lines of data generated by the interns in their reflections of learning when managing the first case of each day in the first week of each term yielded 70002 pieces of quantitative data for analysis.

Additionally, some learning reflections were not complete sets because interns did not necessarily provide information about all aspects of each learnt item, resulting in some 'NULL' records. These learnt items were not deleted; recorded data were used when and where possible and 'NULL' data were accounted for.

Table 5: Data cleansing

Term	Number of learnt items recorded	Deleted lines of data	Total number of learnt items analysed
1	3094	6	**3088**
2	1858	3	**1855**
3	1122	2	**1120**
4	1101	1	**1100**
5	615	0	**615**
Total	7790	12	**7778**

There was a decline in the number of cases reported as the intern year progressed, and a corresponding decrease in the number of learnt items recorded. There was a downward trend in the average number of learnt items per case as the intern year progressed as well (Table 6). The data collected did not have a Gaussian distribution. The median number of learnt items per case was nine (IQR = 9.5). There was a large range in the number of learnt items per case recorded by interns during the year (1-128). In all terms, there was at least one case that only had one learnt item recorded.

Table 6: Data trends over the internship year

Basic Statistics	Term 1	Term 2	Term 3	Term 4	Term 5	Total
Total number of cases recorded	227	152	101	91	65	**636**
Total number of learnt items	3088	1855	1120	1100	615	**7778**
Median (IQR) number of learnt items/case	9 (10.8)	10 (9)	9 (11)	8 (8)	7.5 (9)	**9 (9.5)**
Number of learnt items/case - Range	1-128	1-65	1-63	1-114	1-30	**1-128**

An average of 128 learnt items were recorded by each intern during the five weeks of data collection in their intern year (range 1 - 625), with males recording an average of

147 learnt items (range 3 – 625) and females recording an average of 117 learnt items (range 1 – 436).

4.1.3 SUMMARY

Just over 45% (N = 61) of the 2013 and 2014 intern cohorts provided reflections of their learning resulting from managing their first case of the day for the first week of each rotation, however not all these interns recorded learning in all rotations. Some learning reflections recorded by the interns did not provide any details of learnt items. As a result, some data 'cleansing' was required before data analysis could begin.

The following sections of this thesis chapter details the type of learning interns reported, that is, whether the learning that occurred was via the relationship with their supervisors (apprenticeship learning) or via other self-directed means. It also details what they learnt, where they were when they learnt and when this learning occurred (in which term and rotation). As the *LRS app* provided interns with the opportunity to record learning reflections in a journal as well as a survey, data recorded were both quantitative and qualitative.

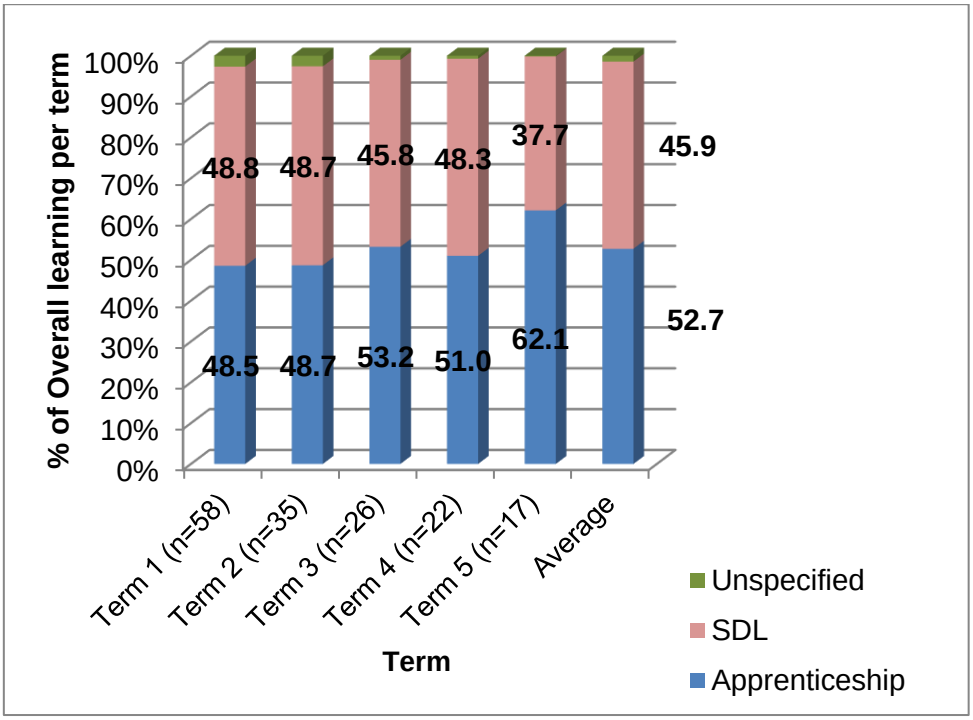
4.2 APPRENTICESHIP VERSUS SELF-DIRECTED LEARNING

As previously stated, for the purposes of this study 'apprenticeship' learning was classified as any learning that occurred as a result of the learning relationship the intern had with their clinical supervisor/s (the consultant and/or registrar). Any other learning that occurred outside of this relationship has been classified as self-directed learning (SDL). This included learning via the nurses, allied health practitioners, the patient and/or the patient's family, peers (other doctors), application of previous knowledge (personal experience, university knowledge, hospital education session, tutorial, lecture) or other resources (Clinicians Knowledge Network – Monthly Index of Medical Specialties (CKN – MIMS), CKN – Therapeutic Guidelines, Uptodate, guidelines, policy, books, 'Dr Google' (using "Google" to search for medical knowledge), formal education session, online tutorial, images, video, PowerPoint).

Of the 61 interns who reflected and reported on their learning, 52.7% of their learning (95% CI [52.1, 53.8]) was via the relationship they have with their clinical supervisors,

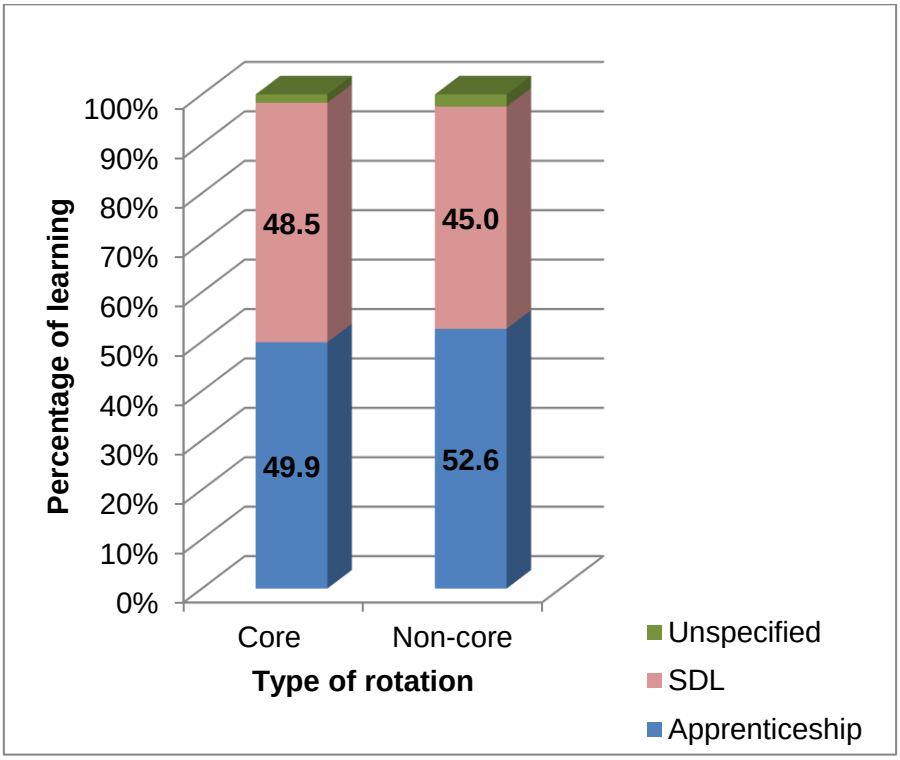
their consultants (21.8%) and/or registrars (30.9%; Figure 7). The remaining 45.9% of their learning (95% CI [45.3, 47.0]) was via self-directed means involving application of previous knowledge (20.8%), peers (7.2%), other resources (6.0%), patient and/or patient's family (5.1%), nurses (4.9%) and allied health practitioners (2.0%), and 1.4% of learning reflections were unspecified. Interns' learning reflections indicated that there was a small increase in the proportion of apprenticeship learning as the internship year progressed. Overall, it appears that interns learnt significantly more from the apprenticeship relationship than they did via self-directed learning ($p < 0.05$).

Figure 7: Apprenticeship versus self-directed learning



On average, interns learnt in diverse ways in core rotations and non-core rotations. The reported 49.9% apprenticeship learning in core rotations (95% CI [49.2, 51.2]) was significantly less than the reported 52.6% apprenticeship learning in non-core rotations (95% CI [51.5, 54.6]; $p < 0.05$; Figure 8).

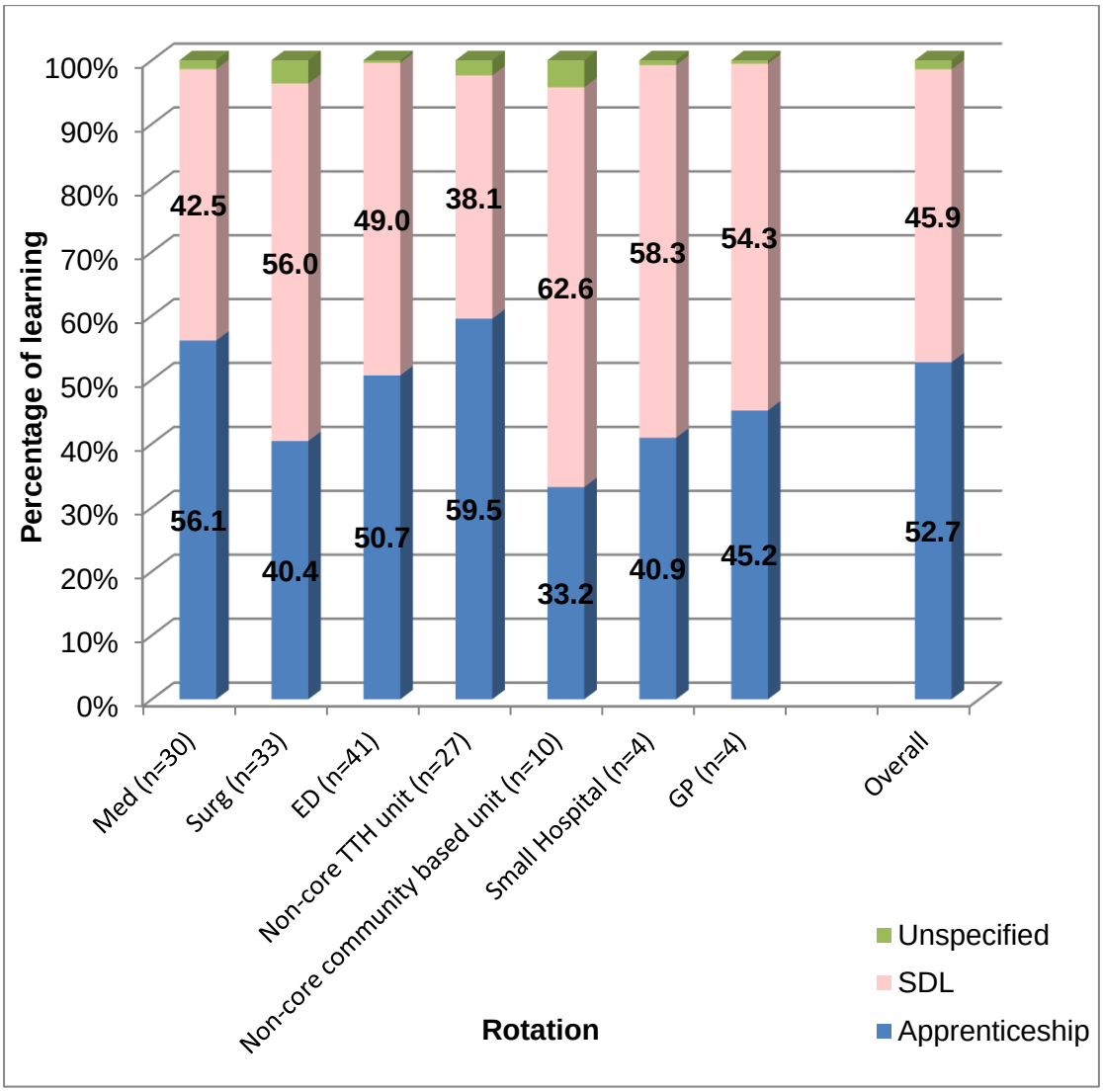
Figure 8: Apprenticeship versus self-directed learning in both the core and non-core rotations



It is important to note that when learning in the individual clinical settings was analyzed, interns' learning reflections showed that learning was not quite the same from one rotation to another (Figure 9). For example, there was no significant difference in learning in emergency medicine with 50.7% apprenticeship learning (95% CI [49.5, 53.0]; $p = 0.30$) and 49.0% self-directed learning (95% CI [47.5, 51.3]; $p = 0.30$). However, in medicine there was significantly more apprenticeship learning (56.1%; 95% CI [55.0, 58.3]; $p < 0.05$) than self-directed learning (42.5%; 95% CI [41.4, 44.6]; $p < 0.05$), and significantly more self-directed learning (56.0%; 95% CI [54.7, 58.4]) than apprenticeship learning (40.4%; 95% CI [39.1, 42.8]) occurred in surgery ($p < 0.05$ for each). In the non-core community-based units and small hospital settings there was also significantly more self-directed learning (62.6% & 58.3% respectively) than apprenticeship learning (33.2% & 40.9% respectively) (non-core community-based unit 95% CI [60.2, 67.2 & 30.9, 37.7] respectively and small hospital settings 95% CI [54.0, 66.7 & 36.6, 49.3] respectively; $p < 0.05$ for each). Interns reported significantly more apprenticeship learning in non-core TTH units (59.6%; 95% CI [58.3, 62.0]; $p < 0.05$) than self-directed learning (38.1%; 95% CI [36.9, 40.5]; $p < 0.05$. There were no significant differences in the types of learning that occurred in General Practice, with

45.2% apprenticeship learning (95% CI [41.5, 52.3]; p = 0.08) and 54.3% self-directed learning (95% CI [50.7, 61.5]; p = 0.08).

Figure 9: Apprenticeship versus self-directed learning in all clinical settings



Female interns reported learning significantly more via self-directed means (53.2%; 95% CI [52.4, 54.6]; p < 0.05) than they did via their relationship with supervisors (44.7%; 95% CI [44.0, 46.2]; p < 0.05). On the other hand, male interns learnt significantly more via their relationship with their supervisors (59.1%; 95% CI [58.2, 60.8]; p < 0.05) than they did via self-directed means (39.3%; 95% CI [38.4, 41.0]; p < 0.05).

Importantly, the embedded qualitative data in the form of interns' journal entries showed that their learning was iterative, that is, interns may have used both apprenticeship learning and SDL with each case, depending on the situation with which they were presented. Alternatively, they may have used only one type of learning. For example:

> *This was a great first case - I was really lucky that everyone in the team is so nice and willing to help out. I was able to use prior knowledge, so I had a direction as to how to take a history, what factors are important, but I was not sure how to do an exam for this particular patient and was able to learn a great deal from the MoLIE consultant who showed me how to do the appropriate spinal examination, showed me the interpretation of the X-ray and gave advice as to appropriate management. She also imparted knowledge such as key points to include in the GP letter such as that it was a low risk MVA. (FReidy26)*

> *While I prefer to learn practical skills by first reading about them and then being shown how to do one, when I am working with theoretical or scientific principles. I am very aware that even experts adapt what they have read to how they can best recall and use the information. With anything that seems important or interesting to me I will always endeavor to study it myself from a reliable text or from published reviews soon after encountering the topic. Another way to put it is if a senior doctor teaches me a fact, for example the evidence to support magnesium infusions in asthma is poor but I find myself that it works very well, I would then conduct my own review of the evidence and remember their opinion. (FReidy26)*

In the first example above, the female intern initially employed self-directed learning strategies. However, she then realized that she did not have the knowledge or skills to examine the patient properly and deferred to the consultant to learn this. Additionally, the supervisor imparted new knowledge and skills to the intern about the interpretation of investigation results and subsequent clinical management of the patient, plus imparted skills to ensure continuity of care for that patient. In the second example, the same intern was happy to initially learn from her supervisor, but then employed self-directed strategies to consolidate the new knowledge.

Interns' journal reflections indicated that learning from supervisors was mostly a positive experience, but this was not always the case. For example:

> *Anaesthetics day #5. Another friendly consultant, happy to show how things were done, but not overly open to sit down and teach. Learning today was more observing their actions and then strategically asking them for explanations of what/why they had done something in a particular way, rather than a sit down and one-on-one teaching session. (MBadesha26)*

> *I know from personal experience not to be overly intimidated by abrasive personalities. There is a certain type of doctor who is intimidating to junior staff, who in reality isn't actually mean by nature, but just shaped by a demanding life, high achievement and frustration with a perceived mediocrity. (FReidy26)*

> *XXX clinic day is something of a bizarre and potentially traumatic experience for the mentally unprepared. Thankfully I was both forewarned and mentally prepared….I picked up a few tips from a TV show where an ex-SAS soldier was describing how to behave when you are being interrogated. Essentially, he said to be completely neutral and grey, to respond to both fronts of kindness and complete aggression with the same emptiness. On clinic days I try to be as calm as a Hindu Cow. (MGrace28)*

Intern journal reflections suggest that they were molded by learning experiences, appreciating good learning experiences when they could get them, and also acknowledging supervisors' 'bad behaviour' as a symptom of working in a very demanding, high-pressure profession. Interns have indicated that they learnt to adapt accordingly for survival in the system. From this perspective, all learning was valuable for the intern.

4.3 HOW INTERNS LEARNT

Once interns identified from whom (or what) they learnt each item, they were then requested to identify how that learning occurred. Examples include someone telling them, listening to someone, someone suggesting something, watching another

clinician, via a demonstration, getting feedback from someone, someone assisting them, answers to interns' questions, at handover, through application of previous knowledge from previous experience, University, hospital education sessions, tutorials, lectures, or via other resources as listed in Section 4.2 of this thesis chapter.

Of the 54 listed ways that interns could nominate as methods of learning on the *LRS app*, applying knowledge from other personal experiences was the most commonly identified method of learning new knowledge (11.3%). The relationship with the registrar was also identified as very important to interns' learning, for example, registrar telling them what to do (9.0%) and listening to the registrar (7.8%). Interns reported that applying knowledge gained at University to new situations (6.5%) and their consultant telling them what to do (6.3%) or listening to their consultant (6.0%) were also more common modes of learning than other modes listed.

There were some differences in interns' modes of learning in the core and non-core rotations. One difference was that in the core rotations, interns learnt through consultants and registrars telling them what to do, whereas in the non-core rotations, they learnt from their supervisors mostly by listening to them. However, in both learning environments, the interns' apprenticeship relationships with their supervisors were still key to their learning (Table 7).

Table 7: Interns' most common modes of learning (N = 61)

Core rotation	% of learning	Non-core rotation	% of learning
Application of knowledge from personal experiences to new situations	13.0	Registrars telling them what to do	7.8
Registrars telling them what to do	8.9	Application of knowledge from personal experiences to new situations	7.7
Listening to registrars	7.2	Listening to registrars	7.6
Receiving feedback from registrars	5.5	Listening to consultants	7.2
Consultants telling them what to do	5.4	Applying previous University knowledge to new situations	5.6

The learning reflections entered by interns provided evidence of the importance of learning relationships with their supervisors.

A surgical patient on my team had developed a deep wound infection and we had to drain pus deeply collected under the surgical skin staples. This was done in what eventuated to be a two-part procedure with my registrar showing me the first time, and the following day asking me to take down more of the wound and irrigate it. The registrar demonstrated what equipment to use and how to open up the skin closed deep to the sutures and get in to drain and irrigate out the collection. The following day I took apart the other half of the wound with the assistance of the ward nurses. One of the experienced nurses gave me some very helpful suggestions which were nice and practical. (MGrace28)

Had a clinic today where myself and the RMO were provided extensive orientation by registrar then consultant. They ran through common complaints, what history and examination, investigations to check including reference ranges they use and common management scenarios. Then was encouraged to see patients in wave consulting fashion. I found the orientation great, such that I felt comfortable seeing patients on my own, formulation my own plan and then presenting to registrar or consultant for feedback. (FWhite23)

I felt supported in my learning during this case. To begin with, I felt more certain of my role, and the consultant laid out clear guidelines for what was expected upon discharge. Allied health staff were also extremely helpful and friendly, which made me feel comfortable about asking for help. (FWalter23)

The model of supervision for learning was often different in the community-based clinical settings, as there were not as many consultants and registrars. The role of the primary care-giver and teacher was often taken on by experienced allied health practitioners. Interns noted this change in model in their journal entries and made mention of the value of learning from these practitioners.

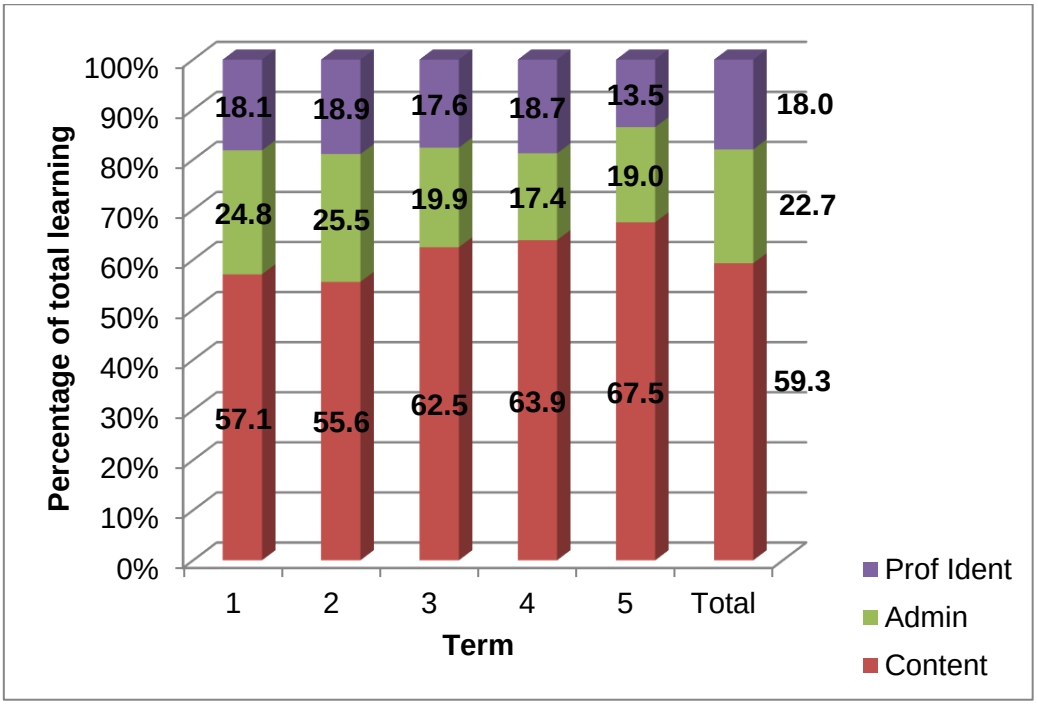
This was a very different learning experience compared to my previous rotation. I'm now based in a community service, and allied health workers often take on the primary care giver role. This contrasts significantly to my last rotation, where doctors took responsibility for management decisions. I still found this a valuable learning experience and am very grateful for the assistance provided by the psychologist I was working with. She benefited my learning significantly. (FWalter23)

4.4 WHAT INTERNS LEARNT

Interns used the *LRS app* to indicate the details of what they had learnt while managing the first case of each day in their first week of each rotation. As described in Chapter 2, Section 2.3.1, learnt items were divided into three domains of learning: content, administration and professional identity.

Interns' learning reflections indicated that on average, 59.3% of their learning was content related, while 22.7% of learnt items were administration related and 18.0% were professional identity related items. There was a trend in the percentage of content learnt by the interns as the year progressed and fluctuating amounts of learning in the administration and professional identity domains throughout the year (Figure 10).

Figure 10: Interns' learning in each domain

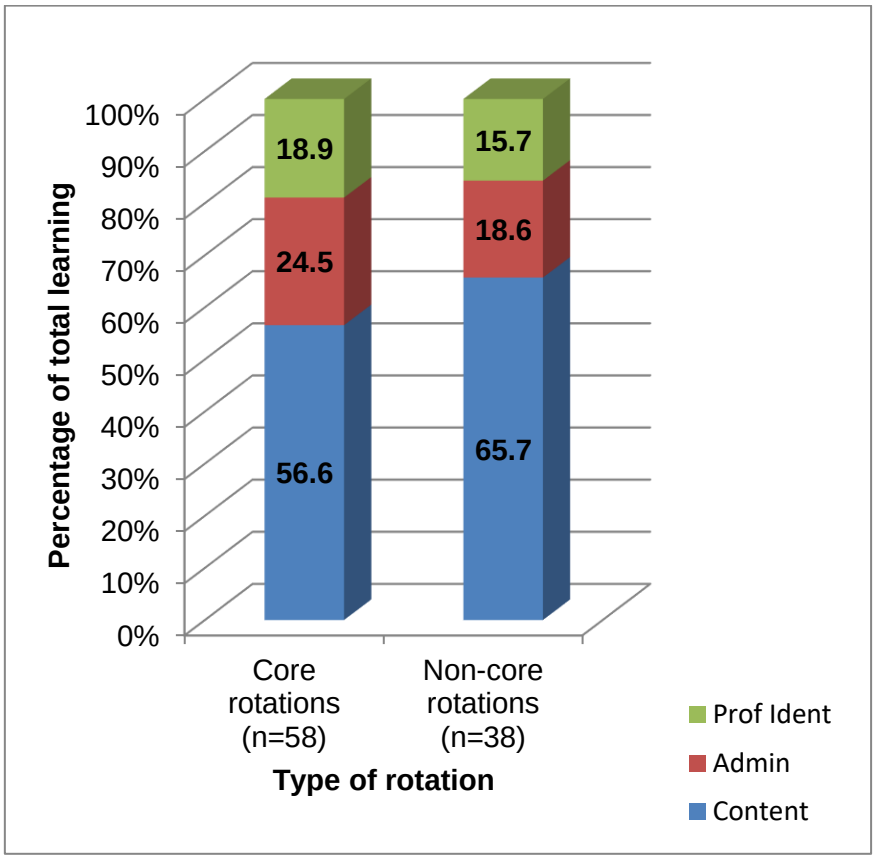


Overall, interns reported significantly more learning of content and less of administration whilst in the non-core rotations with $p < 0.05$ for both (Table 8 & Figure 11).

Table 8: Amount of learning in each domain in core versus non-core rotations

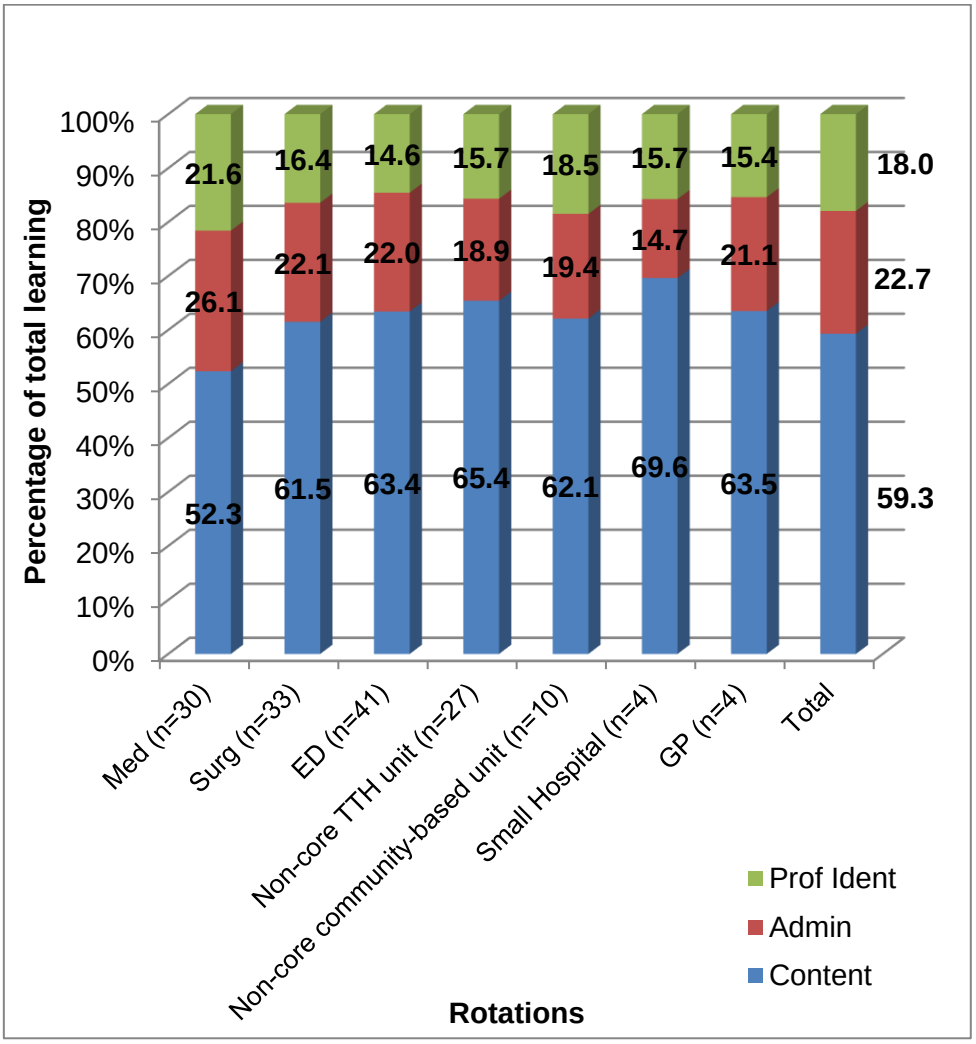
Domain	Core rotations	Non-core rotations
Content	56.6%; 95% CI [55.9, 57.9]	65.7%; 95% CI [64.7, 67.6]
Administration	24.5%; 95% CI [23.9, 25.7]	18.6%; 95% CI [17.9, 20.2]
Professional Identity	18.9%; 95% CI [18.4, 20.0]	15.7%; 95% CI [14.9, 17.1]

Figure 11: Domains of learning in core versus non-core rotations



More specifically, there were minor differences reported by interns in the domains of learning associated with each rotation. The learning in medicine was reported as being less about content and more about learning administrative tasks and professional identity than any other rotation, and proportionally more content was learnt in the small hospital setting than in any other setting (Figure 12).

Figure 12: Interns' domains of learning in each rotation



Male interns reported learning significantly more content than female interns ($p < 0.05$), while females interns reported learning significantly more administration than male interns (Table 9). There was no significant difference between male and female reported learning in the professional identity domain.

Table 9: Percentage of reported learning in each domain

Domain	Gender	% learning	95% CI
Content*	Males	63.8	63.0 – 65.9
	Females	56.1	55.4 – 57.6
Administration*	Males	18.9	18.3 – 20.3
	Females	25.5	24.8 – 26.7
Professional Identity	Males	17.2	16.6 – 18.5
	Females	18.5	17.9 – 19.6

*Note p sig at < 0.05

4.4.1 MOST COMMON CONTENT LEARNT BY INTERNS

Interns' learning reflections indicated that the top five learnt items were patient's history (8.7%), clinical knowledge (4.9%), how to examine a patient (4.7%), how to interpret investigation results (4.2%) and the correct medication to prescribe (4.2%). All of these lie within the content domain of learning and represent 14.6%, 8.2%, 8.0%, 7.1% and 7.0% respectively of what was learnt in the content domain of learning.

The interns' journal entries elaborated some of these learning experiences. For example:

> *I am further developing my history and examination skills through observation of the consultant and registrars and through practice on the ward and in the emergency department. (FJardine23)*

> *As this was the first patient that I had been involved in managing as an intern I still needed a lot of guidance from my superiors and was sure to check the prescribing guidelines before writing the medication up. With time I am sure that I will become more confident on the ward, which will allow me to develop my clinical knowledge rather than just administrative skills. (FLouk23)*

> *Today I sat in on the Infectious Diseases clinic with one of the microbiology registrars. We saw a patient with chronic Q fever. We discussed the history of Q fever and I was quizzed on my knowledge of the disease process. We discussed the interpretation of Q fever serology, how to make the diagnosis, the treatment regime and its common side effects and the reasons for treatment. After the clinic I read my ID text books section on the topic and then recorded what I had learned in an evolving document in our office "What I learned today". Some of this discussion took place with the patient present, and then after the consultation we had further discussion and I could check my understanding. (MGrace28)*

The examples above also describe the learning relationships the interns had with their supervisors.

4.4.2 MOST COMMON ADMINISTRATION LEARNT BY INTERNS

The five most common learnt items in the administration domain of learning reported in interns' learning reflections were what to write in patient notes (10.9%), how to write up patient charts/notes (10.7%), how to communicate with other health professionals (10.5%), where to find forms/paperwork (7.6%) and how to refer patients to other health professionals (5.3%).

The most notable evidence provided by interns regarding learning tasks in the administrative learning domain came from journal entries where they elaborated on their difficulty in learning the administrative side of clinical practice. For example:

> *Many of these learning items, for example how to write in patient notes or how to present patient, are not explicitly learned or taught. Rather, I think we just do these things and get better at them. It would probably be useful to get explicit feedback about these sorts of things from peers and seniors, but there often isn't time, or it just isn't done. (FColby24)*

> *The patient required completion of a medical certificate and also a travel compensation certificate. I knew roughly what was required, but there were a few specifics that I needed to ask one of the nursing staff who was looking after the patient about. I feel it would be impossible to account for all the possible forms that need to be filled out, so learning on the job like this is sufficient. (MHunter26)*

> *We made the morning meeting and hit the wards, our list big enough to be busy but not big enough to overwhelm us. But in all honesty, Dr. X and Dr. Y were supremely supportive and gave us the time to clarify and double check to ensure we were all on the same page. Clerking as an intern seemed suddenly more difficult than as a student. (MO'Regan23)*

4.4.3 MOST COMMON PROFESSIONAL IDENTITY LEARNT BY INTERNS

The five most common learnt items reported in the professional identity domain were how to work in a team (16.8%), what to say to sound professional (8.1%), how to reason out a differential (7.9%), my scope of practice (7.5%) and when to ask for help (5.9%). Interns' journal reflections highlight the importance of teams and team work.

It is quite surprising the number of different teams that get involved with a fairly simple diabetic foot admission... (MGray38)

This learning experience again highlighted the difference in roles within a community setting. In this situation, the most experienced professional was the psychologist, so she led the session, and the registrar and myself followed her lead. This reiterates the importance of team work and using everyone's strengths - doctors don't always have to be the leaders, and nor should they if there is someone else more qualified. (FWalter23)

The journal reflections also articulated how the interns developed professionally. *FWalter23* described several learning opportunities in this regard.

This was again a good learning experience, in that my supervisor helped me work through the likely differentials and alter the investigations I ordered according to this. I was able to apply my prior knowledge to a current clinical situation. I was also able to practice referring patients to another team. (FWalter23)

Today my learning was more administrative (i.e. where to find radiology), but I was also able to learn who to approach regarding investigations, and the information they require. Previous personal experience has taught me what I'm supposed to say to sound professional, but I still get quite anxious about approaching seniors, and worry about what I will say. I think this is improving with practice. (FWalter23)

I often feel uncomfortable asking for help when I think I should be able to perform a task on my own. I did have difficulty in this case however and could see it was better for the patient to ask someone more senior to assist. (FWalter23)

The least common learnt items reported by the interns in their learning reflections were research (0.2% of the content), how and when to prioritize (both reported as 0.6% of administration), how to motivate myself and other unspecified learnt items (0.7% and 0.5% respectively of professional identity).

4.4.4 LEARNING IN CORE VERSUS NON-CORE ROTATIONS

The Review of Medical Training: Final Report (Australian Health Ministers' Advisory Council, 2015b) highlights that there is much debate about whether or not the core rotations provide general experiences. The data collected in the *LRS app* allows some exploration of the differences in what is learnt in the core versus the non-core rotations.

The top five most commonly reported items learnt in the core rotations were patient's history (7.9%), how to examine a patient (4.9%), how to interpret investigation results (4.3%), clinical knowledge (4.3%) and correct medication to prescribe (3.7%). The top five most commonly reported items learnt in the non-core rotations were patient's history (10.4%), clinical knowledge (6.3%), correct medication to prescribe (5.3%), medication dosage (5.0%) and condition details/theory (4.8%). The patient's history was the most commonly reported item learnt by the interns in all clinical situations. All of the top five learnt items in both core and non-core rotations sat within the content domain of learning, and most of this learning came from the interns' supervisors, their consultant and/or registrar. Once again this highlighted the importance of the apprenticeship relationship.

As there have been questions raised about the uniqueness of learning that occurs in core rotations, a further analysis of the learnt items in each of the learning domains in core and non-core rotations was undertaken. This analysis showed that most of the top five learnt items in each domain for core and non-core rotations were common, however there were different emphases placed on some items (Table 10). Learning the patient's history and how to work in a team were the most reported content and professional identity items learnt in both the core and non-core rotations. What to write in patient charts/notes was the most reported administrative learnt item in the core rotations, however this was the third most reported learnt item in the non-core rotations. Conversely, how to communicate with other health professionals was the most reported administrative learnt item in the non-core rotations, however this was the third most reported in the core rotations. Once again, most of the learning for the top five learnt items in both the core and non-core rotations came from the interns' apprenticeship learning relationship with their supervisors.

Table 10: The top five learnt items in each of the learning domains in core and non-core rotations

Type of rotation	Content (%)		Administration (%)		Professional identity (%)	
Core rotations	Patient's history	14.0	What to write in patient charts/notes	10.3	How to work in a team	14.9
	How to examine a patient	8.7	How to write up patient charts/notes	10.0	How to reason out differentials	8.6
	How to interpret investigation results	7.6	How to communicate with other health professionals	9.0	What to say to sound professional	7.8
	Clinical knowledge	7.5	Where to find forms/paperwork	8.5	My scope of practice	7.4
	Correct medication to prescribe	6.5	How to refer patients	6.2	My limitations	6.0
Non-core rotations	Patient's history	15.8	How to communicate with other health professionals	15.1	How to work in a team	22.1
	Clinical knowledge	9.6	How to write up patient charts/notes	13.0	What to say to sound professional	9.0
	Correct medication to prescribe	8.1	What to write in patient charts/notes	12.6	My scope of practice	8.0
	Medication dosage	7.6	Where to find forms/paperwork	5.0	How to reason out differentials How to improve my practice	6.0
	Condition details/ theory	7.4	How to discharge patient	4.6	When to ask for help	5.7

A further breakdown of the five most commonly reported learnt items in each of the core rotations and the five most commonly reported learnt items in each domain of learning within each of the core rotations of medicine, surgery and emergency medicine were reported by Agnew, Sen Gupta, Quirk, Evans and Larkins (2017). This analysis also showed that most of the top five learnt items in each domain for each core rotation were common, however there were different emphases placed on some items.

4.5 SUMMARY

Intern reflections of what they learnt as they managed the first case of each day of their first week in each rotation were recorded on the *LRS app.* This included elaborations

of some of their learning via journal entries. This chapter presented the main findings of the investigation of interns' learning reported via the *LRS app*.

Interns reported that on average, they learnt more via an apprenticeship relationship than they did via other self-directed modes of learning. However, female interns reported learning more via self-directed modes of learning than they did via apprenticeship relationships. On average, there were significant differences in whom (or what) the interns learnt from in core and non-core rotations and there were also significant differences from one rotation to another, indicating that different rotations offer interns different learning experiences.

The results described in this chapter show that learning was an iterative process, in that interns may have used both apprenticeship learning and/or self-directed learning, depending on the cases they were working on. Interns learnt mostly by applying knowledge from other personal experiences, listening to their registrar, the registrar or consultant telling them what to do or applying University knowledge to new situations. Interns' learning did not always come from positive experiences; they also learnt from negative experiences, including observations of others' 'bad behaviours'. There were some differences in the modes of learning in the core and non-core rotations, however the apprenticeship learning relationship the interns had with their supervisors was still identified as being key to their learning.

Overall, interns learnt more content than they did administration or professional identity items throughout the internship year. In fact, there was a trending increase in the percentage of content learnt by the interns as the year progressed. Male interns reported learning significantly more content and less administration items than female interns. Interns reported more learning of content and less of administration in the non-core rotations than in the core rotations. There were also some differences in what they learnt from rotation to rotation.

The top five learnt items recorded in the interns' reflections were all from the content learning domain. In their journal entries, interns made note of their difficulty in learning the administrative side of clinical practice, pointing out that these were not things that were explicitly learnt or taught in University. How to work in a team was the most commonly learnt professional identity item. There were minor differences in what interns learnt in the core and non-core rotations.

The results described in this chapter showed that interns have relationships with their supervisors that feature in their learning. To further explore the concept of apprenticeship learning in medicine, semi-structured interviews of both interns and their supervisors were carried out. The results of these interviews are discussed in detail in the following chapter.

CHAPTER 5 – PERCEPTIONS OF MEDICAL INTERNS' LEARNING IN AUSTRALIA

5.1 INTRODUCTION TO PHASE 3 – PERCEPTIONS OF HOW INTERNS LEARN

The previous chapter summarized the analysis of the data collected via the *LRS app*, focusing on the quantitative data and elaborating with the qualitative data from journal entries. Phase three of this study involved semi-structured interviews with supervisors and interns to investigate the concept of the medical apprenticeship and how it works. This chapter will present the qualitative data analyses of these interviews, providing illustrated details relating to how and what interns in Australia learn during their internship.

Twelve consultants and six registrars were interviewed. All of these intern supervisors were employed by the Townsville Hospital and Health Service at the time of interview, however they worked in a variety of specialties and in a variety of facilities; specialties working out of the main acute block of TTH included medicine, surgery, anaesthetics, emergency medicine, endocrinology, rheumatology, paediatrics and infectious diseases; specialties working out of other sites included palliative care, child and youth mental health, psychiatry and sexual health. Supervisors from a number of small regional health services such as Charters Towers hospital, Ingham hospital and the Joyce Palmer hospital on Palm Island also participated. Most of the consultants were 35 - 49 years old and five were older than 55 years old. The age group 50 - 54 was not represented. The ages of the registrars ranged from 25 - 39 years old.

Only two of the twelve consultants interviewed undertook their medical degrees in Australia. Other consultants undertook their medical degrees in the UK (5), Ireland (2), India (2) and Canada (1). These interviewed consultants graduated 25.3 years ago, on average. This indicated that the consultants were quite experienced. All of the consultants except two completed their internship and junior doctor training in the same country in which they undertook their medical degrees. The two exceptions undertook their medical degrees and internships in the UK and then moved to Australia to complete their junior doctor training. Consultant supervisors interviewed have had their fellowships for an average of 16.1 years.

All interviewed registrars except one undertook their medical degrees in Australia. The one exception undertook their medical degree in the UK. The registrars interviewed graduated 5.3 years ago, on average, indicating that the registrars were moderately experienced clinicians. All the registrars completed their internship and junior doctor training in the same country in which they undertook their medical degrees.

All of the 20 interns who volunteered their time to be interviewed except three were in the younger than 25 or 25 - 29 age groups. One intern was 30 - 34 and two were 35 - 39 years of age. Eleven interns completed undergraduate medical degrees and nine completed postgraduate medical degrees. Most of the interns interviewed reported that their medical degrees consisted of problem-based learning (PBL) alone or in combination with some didactic lectures. PBL was described as learning-based or case-based scenarios, where learning required problem-solving clinical cases and presentations of possible management options. Other interns spoke about developing their own learning objectives for the week, taking a more self-directed approach to learning.

5.2 DESCRIPTIVE ANALYSIS

As detailed in Section 2.6, transcripts of the supervisor (consultants and registrars) and intern interviews were initially coded using values coding for 'attitudes', 'beliefs' and 'values' as described by Saldana (2013). A second cycle of deductive descriptive analysis was then conducted to filter and focus the salient features to allow identification of relevant themes. The final themes that were synthesized from the interviews are summarized in Table 11 and presented in detail below.

Table 11: Summary of identified themes

Themes
Learning medicine is complex, an iterative process
The internship occurs in a time-poor learning environment
Learning during internship is via a cognitive apprenticeship
Interns must be adaptive learners
Interns must negotiate a number of tensions
Desire to be deemed competent, fear of failure and doing harm to patients motivates interns to learn
Interns value interactions with knowledgeable supervisors
Interns want to be enculturated into the medical fraternity
Interns want to be independent practitioners

5.2.1 LEARNING IN MEDICINE IS COMPLEX

Most tertiary degrees equip graduates with the knowledge they require to work in their chosen field. Medicine however is different, as applying knowledge in medicine in real contexts is complex. A medical degree provides the necessary knowledge-base, but the nuances of being able to diagnose and manage illness in humans is largely learnt after medical school; human illness rarely displays as textbook presentations.

> *And I think, certainly if you could recite [Marshall & Ruedy's "On Call"] that's great, but, reciting text books and translating it to someone who needs the airway management, you know breathing and all these sort of variables. But you're dealing with dynamic humans, it's really quite difficult. (Supervisor 15)*

Supervisors assumed that interns have basic knowledge of conditions from medical school and that this formed merely a skeleton for the real learning that needed to occur to be a fully-fledged medical practitioner.

> *They've got the basic knowledge, they've proven themselves to that extent, they've got the intelligence, now they have to build on that by putting that into work and that doesn't happen overnight, obviously. (Supervisor 17)*

However, supervisors articulated that learning in medicine was complex. Like bricklayers who need to lay bricks as part of their learning to be a 'Brickie', interns must work with patients to learn the tools of their trade, to learn the intricacies of determining differentials, making diagnoses, developing clinical reasoning and perfecting appropriate management plans. Therefore, like the apprentice Brickie who works on a building site, clinical settings such as hospital wards, operating theatres and clinics become the interns' learning laboratories and their day to day work provides the learning experiences for them to develop the knowledge and skills to become competent medical practitioners. The intern perspective of learning was similar in its description.

> *Basically in medicine, what I say is in general medicine or in a non-surgical field, what I find is that your day to day work is your laboratory. So what you learned, what you're doing and how to consult, what is the final result? And depending on the experience, you learn. (Supervisor 6)*

You can't learn how to be an intern. You can't learn how to be a doctor without being a doctor, you know, you have got to have, you just can't learn this job from a text book. I think you only learn it by doing. (Intern 9)

The complexity of current care is the result of medicine being an expanding science. This translates to patients having more 'stuff' done to them in shorter periods of time than in previous centuries. Learning during an internship must consist of work-shadowing more experienced doctors and supervised practice. However, learning in medicine is not a straightforward process; it is often complicated and convoluted, with many ways to learn. Learning is an iterative, multifaceted process with no one pathway that interns can follow.

Probably a lot of my learning is, like there might be one case [where] a patient has a certain condition and that's the way you treated it and so that's probably more personal experience that I've then used for another case. But it's probably not the best in terms of, you know a particular electrolyte's off and we did that that time, but you know that's not teaching me the five other ways that I can deal with that particular problem. It's just that's one solution, one person's solution. So that's probably, like personal experience is great, but it's not as thorough I guess as another resource. (Intern 1)

Probably there's lots of different ways, and it depends on the specific skill or, I guess, divide skills and knowledge broadly. So for skills, mostly by either observation or trial and error. And for the knowledge, I guess it's kind of through, again through observation, through reading, like for study, other courses, lots of different stuff I think, lectures. And that's pretty cumulative I think. And then you see that applied in different areas, and then you go back and you realize that you didn't know what you knew, and you go over it again. (Supervisor 18)

There was some conjecture amongst supervisors and interns who were interviewed as to who the 'master' was in the interns' learning relationships. Most consultants felt they held the role of 'master', while others believed that supervision may be multidisciplinary, that is, a supervisor could be anyone in the team, any senior health professional, not just medical. This was referred to as a shared-care approach. Registrars felt that consultants ideally were the 'masters', however in practical terms,

this role was often delegated to them. Interns were happy to place the ‘master’ tag on any doctor more senior to them, nurses and/or allied health practitioners.

> *In our work, it's not necessarily on one person [to supervise], it's provided by different people. That's what I'm trying to say. Because apprenticeship normally means that you are with this person. But in the current health climate, you will have a resident, and they will have a registrar they might be doing things with and there's the consultant. So there's the different layers of people during their apprenticeship. (Supervisor 10)*

> *I think it’s very hard to do an apprenticeship and learn from health professionals, because the skill base is so different. However, with that said, I think there are things that you can learn in terms of patient interaction and usual protocols, from people who have been in the system a long time. (Supervisor 16)*

> *I think the masters, there are multiple, and I really think it is anyone who is more experienced in a certain field is going to be the master, so whether it’s the physio or the clinical nurse or the pharmacist or the consultant or the registrar, those are the people that we should be looking for knowledge for assistance when we need it, yeah, so they would be the masters. (Intern 7)*

Least useful situations for learning articulated by both interns and their supervisors was where interns only carried out clerical work, where they were not provided with opportunities to participate in clinical work, where they were merely passive observers, where they had heavy clinical workloads, where teaching was by humiliation, or where teaching was not pitched at the right level and/or was irrelevant to the cases the intern was managing.

5.2.2 LEARNING OCCURS IN A TIME-POOR LEARNING ENVIRONMENT

The interns’ learning was constrained in two ways. Firstly, although consultants and registrars were the interns’ main source of learning, they often had many time constraints on their ability to teach. In the words of consultants,

I don't think any consultant has enough hours in the day to observe [interns] enough. (Supervisor 1)

I think that [a structured approach to learning] would be a lot better than the current kind of haphazard, pick up what you can, when you can, in the context of a very busy work environment. So the registrars don't always have time to kind of, go through stuff … especially with, you know, the numbers. There's often a couple of interns, five or six students, plus your workload as well. It's hard to do it well. (Supervisor 18)

Secondly, the interns had a lot of clinical and administrative responsibilities that consumed their working time, leaving little time for 'extra' learning or consolidation of learning to occur.

There's definitely not the time actually to sit down and look stuff up. It would be nice I suppose to have time to work things up enough and then read about them, look different things up like you know, look up certain treatments or look up certain prognoses or stuff for people, but you just don't have the time to do that, rarely have the time to do that. (Intern 10)

If you're in a busy team, … you have trouble seeing all of your patients. You're not going to ask your supervisors, can you teach me about this, why is this that way, you know. You just, you're stressed out, you're wanting to get things done so that they can get home on time. (Supervisor 16)

5.2.3 LEARNING DURING INTERNSHIP IS A VIA A COGNITIVE APPRENTICESHIP

Much of the interns' learning occurred as they worked clinically. The year of internship is, by definition, a year of supervised practice. There are many forms that this supervision may take, and the intensity of supervision modulates as the interns develop their clinical acumen over time and the 'master' builds up confidence in the capabilities of their junior. Learning during internship was predominantly situated learning, that is, learning at the bedside or learning within the clinical setting, as expressed by these interviewees.

I think hands on…. You know we have had so many years when we had to read books and read chapters and memorize numbers and figures, but now I guess if I don't see something and examine the case, you know, discuss the problem with the patient and my supervisor, then I don't think I would learn. (Intern 14)

In my own unit, the intern has to see patients. They then present those patients either to the registrar or to myself at the ward round, and also at the weekly clinics they get to see patients first and then they come and discuss it with me. So it is a process of getting them to take responsibility for their clinical decision making. (Supervisor 7)

Direct supervision of interns at the bedside or in other clinical settings provided the coaching required that ensured there was scaffolding for learning whilst ensuring patient safety was not at risk. There was also an incremental decrease in the level of this supervision over time and a corresponding increase in responsibilities given to the interns to provide them with a safe learning environment whilst assisting them in developing the knowledge and skills required to become independent practitioners.

I think it works in the sense that you become independent and responsible and aware of where your responsibilities lie, so the apprenticeship works in the sense that you are a part of the team. You're not necessarily expected to have extensive knowledge, but you are expected to have certain levels of responsibility for patients that you become more aware of your responsibilities to the patient, and to the senior doctors, which is similar to any apprenticeship. (Intern 6)

That means that we're trying to give them the skills to be independent practitioners, but that there's a degree of supervision required during that process, and … they don't ultimately have autonomy for all of the decisions during that process, and that we're gradually giving them more responsibility during that time and its just a process that assesses the safety of people to progress to the next step. (Supervisor 3)

Demonstrations of professional practices and clinical procedures by registrars and consultants provided models for the interns to structure their own practice. Interns also

articulated the use of a 'see one, do one' process in their clinical practice, where they observed a more senior clinician and then tried to copy or mimic them; there was an element of risk to this that seemed to be accepted as part of the way in which interns learnt.

> *Well [registrars are] the go to ones when you don't know how to do something, or how to organzse something or, or if you are concerned about something you don't want to do, then they definitely are the go to. And they're more the practical learning, you know. Very often they don't really quiz you on theoretical stuff or expect you to do soft things, they sort of give you a hand by showing you. You learn kind of thing. (Intern 10)*

> *Well for us it's all an apprenticeship style thing, on a one to one basis. Lot of its showing people how things work, question how and why we're doing things, and propose various scenarios that they can solve. (Supervisor 8)*

> *I also learn a lot kind of just watching what people do and mimic them, which is probably a poorer quality of learning because I don't know if they're doing the right thing or not… I give Metoprolol because someone else gives Metoprolol. (Intern 13)*

Additionally, consultants also spoke about the notion of interns learning via 'osmosis', where consultants explained their clinical reasoning and then the interns worked with their patients.

> *Osmotic learning is that in the medical field, the team, we work as a team, and there are different levels of expertise in this team. They are given this data and how the senior incorporates those data to make a plan, and they also learn in that way. OK, if the patient has this type of chest pain, this type of radiation, consultant is thinking in that way, that's why it is pulmonary embolus, not myocardial toxin, for example. And when we explain, this is what they also learn. So it is always in the text book, but when they see in the real life, and they start to grasp what was originally in the text book actually means in the real life. And this is what I said is osmotic learning. (Supervisor 6)*

Interns also expressed the importance of 'learning by osmosis' and having discussions with and questioning supervisors. Importantly, interns indicated that regular feedback and appraisals of their performance provided by supervisors provided them with the opportunity to reflect on their learning.

> *I think that at the moment the mid-year, and end of term appraisals are really worthwhile and beneficial, but I find it much more beneficial if they could see me doing something, straight away if they say, "how about you fix this up" and then go to the next patient, and then you'd fix them up straight away, and everything would be really really good. (Intern 4)*

> *I think that they learn best when if they try first and then get immediate, give them feedback on exactly what just happened there. So, in the ideal world [supervisors] actually observe [interns] interviewing and [doing] a physical exam …. But even hearing about their history exam and their differentials following that, and then giving them feedback at that point in time as to how they did. That's probably the best way still [for interns to learn]. (Supervisor 1)*

The learning of medicine is a continuum; learning how to be a doctor starts at medical school and never ceases whilst medicine is being practiced. Basic knowledge was acquired at medical school, however human illnesses do not necessarily mirror what was described in text books. For interns, the nuances of medicine were therefore developed through supervision of their clinical practice. For supervisors, identifying the interns' knowledge-base was an essential starting point for further learning; supervisors used constructive teaching and learning methods to maximize the interns' learning.

> *I think like at university you learn all the text book stuff, all the sort of knowledge, the content based things, and then the internship year and maybe the residency years are an apprenticeship so you're learning, to actually have to work in the real world. And you have to do your work as a doctor, not just learning about conditions and learning about textbook kind of problems. (Intern 18)*

> *So it's kind of trying to fill in the deficits in their knowledge base or trying to flesh out something that they think they know about but they want to bring it to another level of knowledge. (Supervisor 4)*

> *So I think, yeah, it's an apprenticeship because the textbook stuff is supposedly done to some extent. They've got the basic knowledge, they've proven themselves to that extent, they've got the intelligence, now they have to build on that by putting that into work and that doesn't happen overnight, obviously. Internship's there, probably legally because, you need somebody to supervise you at that extent, you can't just be let loose straight away. But you're continuing to build the whole time, it's all an apprenticeship. I'm registrar training, I'm still, you know in an apprenticeship you know. (Supervisor 17)*

The learning scaffold provided by the interns' supervisors as described above, supports the notion of interns undertaking a cognitive apprenticeship. It entails interns observing their supervisors to learn the medical practitioners' "tricks of the trade" (modeling), interns mimicking their supervisors in a safe learning environment (approximating), supervisors stepping back when interns were ready (fading) and encouraging interns' self-directed learning when appropriate (Brandt et al., 1993). As the interns became more experienced towards the end of their internship, there may even have been some instances where they could apply what they had learnt to new and unique cases (generalize), but there was no expectation that interns would master this skill before the end of their internship.

> *If you understand the rationale then you will be able to apply it to different situations rather than just doing, on autopilot, because auto pilot doesn't account for the people that don't follow the rules. (Intern 6)*

5.2.4 INTERNS MUST BE ADAPTIVE LEARNERS

Interns described a variety of methods of learning during their internship including learning via the apprenticeship relationship they had with their supervisors and by self-directed means. These descriptions were mirrored in the supervisors' perceptions that interns learnt by both apprenticeship learning and other forms of learning. There was therefore a belief that interns must be adaptive learners, that is, they must be able to take advantage of the apprenticeship relationships they have with their supervisors when opportunities for learning present, but they must also recognize when self-directed learning was appropriate in order to advance their professional knowledge and skills.

I think it is a combination really. Obviously we don't really get any didactic teaching in the clinical setting, which is good. I think it is a bit of self-directed and that any time if there's something I feel I am uncomfortable with, it usually means to me that I need to read up more about it just so I feel comfortable. So I'll do that. Also if there is a question in terms of someone's care clinically that I don't know obviously at the time, then I'd ring the registrar or ask a peer depending on how critical the question is or how high level it is. And obviously I think we get a lot of learning from being with the consultants and being with the registrars and watching them work, and then maximising every situation as a learning situation. So just try and take as much out of it as you can really. (Intern 7)

I think they learn by observing, by participating and by receiving feedback on their activities which they do on the ward. I think they also then learn by self-directed learning and by participating in presentations and discussions forums and in their education activities that they go to, which are organized. I think they also learn from listening to patients and interacting with people and also by observing what other people do on the wards, not just what consultants and medical staff are doing, but how nurses work with patients, how orderlies take patients to and fro. So there's lots and lots of different aspects I think to an intern's learning. (Supervisor 4)

5.2.5 INTERNS MUST NEGOTIATE SEVERAL TENSIONS

Interns must negotiate several tensions as they complete their internship. The largest tension was perhaps the requirement for interns to learn versus their requirement to be part of a service provision team for the organization. The interns' learning was often not the focus within some rotations, because of the primary role that interns played in providing medical care for patients.

Another issue that I can think of would be workload. If you are swamped with work, you're not going to want to learn, because you're just trying to keep your head above the water. (Supervisor 16)

It definitely changes as per the different rotations that you're on and what your role is…. Like some of my electives … you feel like you are really there to learn as opposed to just do stuff. And so those rotations were very much like learning heaps, like sitting down reading things up, going to teaching, being taught by registrars and consultants and really [there is a] heavy focus on that, whereas other terms …, it's really, really busy and you're there to get stuff done. (Intern 12)

Another tension arose when interns were required to conduct 'paper-pushing duties' for a substantial portion of time rather than having opportunities to experience practical/clinical learning activities. These were tasks that were essential for continuity of care, however currently, no other healthcare workers within the organization had been identified to assist interns with these tasks.

It is pretty hard to go through an eight hour day and have not sort of done that much medicine, you've just done paperwork, after paperwork, after paperwork. And you normally know why you are doing it but you are not necessarily always learning. (Intern 2)

Some rotations, the consultants would be quite active in setting, in sitting down and setting the learning objectives and essentially guiding what you should be learning throughout the term. Other rotations, you felt like you were really there just to do the paperwork and if you learnt something out of it, that's well and good, but if you didn't that doesn't matter, that's the right forms and organise what needs to be organized. (Intern 5)

Sometimes, there's just so much admin, there's so much paperwork and there's so much documentation that's increasingly required…. Sometimes I think the interns can be at the bottom of the pile and be the ones doing the menial tasks and perhaps not get as good a learning experience as they could. Because often, you can just have interns working as clerking machines, or filling in forms, or inputting data, or whatever, and I don't think that helps them to develop their critical thinking. (Supervisor 9)

Interns desired to be independent practitioners, however as prevocational doctors with provisional registration, there was a requirement that they be supervised at all times. This too creates a tension to which that they must find solutions.

> *The best way for me to learn is to have a go myself and then have someone then check with someone else or have someone check what I am doing, but as long as I can have a go first, if I get it wrong then I will remember that mistake forever and I'll never make it again. And if I get something right I can feel really good about that and apply it next time. If someone is just kind of telling you what to do all the time then I don't tend to absorb that quite as well. (Intern 9)*

Conversely, like a parent letting go the hand of their child, it was often difficult for the supervisors to step back and hand over responsibility of their patients to the interns.

> *Well it needs to be closely guarded I guess. Almost a one-to-one [relationship] as possible, getting this term and not be left to deal with their own circumstances all the time. Because they can feel that they're not up to it, to get up there…. I don't think they should be allowed to function completely independently. (Supervisor 5)*

> *So when I have interns in the clinic, … I won't let them sort of independently go and see and say the wrong thing to the patients. So I will be there if and when they talk to the families. So under direct supervision. (Supervisor 10)*

5.2.6 INTERNS VALUE INTERACTIONS WITH KNOWLEDGEABLE SUPERVISORS

Interns valued having interactions with knowledgeable supervisors, especially when it provided insight into intangibles such as how clinical reasoning works.

> *I was really lucky because I had really good consultants who were happy to teach. So that could be, you know, as blatant as the consultant coming and sitting down and saying look I've got some time, what do you want to know about, let's have a chat about it and work through it. So that was always really great. (Intern 9)*

The most valuable thing [consultants] can teach apart from all the knowledge they have, is their thought process and approach to things, explaining why they have come to the conclusion they've come to and encouraging you to reach that same point, because it is not as mentally taxing for them as it is training and being an intern to reach that point quickly, because of their experience. (Intern 15)

Well consultants seem to have the knowledge most well consolidated so that when something unusual came up, they were able to understand it from a perspective that we wouldn't understand. So, I feel that when I am able get a little extra time with the consultant, you learn a lot…. Everyone wants that time, but when you are in there and you do have that little extra time and they taught you something, things start to really click. (Intern 17)

5.2.7 INTERNS WANT TO BE ENCULTURATED INTO THE MEDICAL FRATERNITY

There are some parts of medicine that cannot be learnt from a text. There was a perception that competent medical professionals were somehow different in the way they think, the way they behave and the way they present themselves to their patients. Interns valued opportunities to be immersed in this culture, to gain this tacit knowledge, to become an accepted member of the medical fraternity.

But professional identity is [difficult to learn]. I guess cultural stuff comes into this as well, which makes it all too difficult…. I think it is something that we've all sort of put in the back of our head that it just happens you know, and you can't necessarily learn it in a sort of formal way. It's more of informal, develops over time. (Intern 2)

I think medicine should be a fraternity that highly values [teaching and learning], and I think that what I've seen over the years while I've been training as a student is that, that I think as a culture, medicine highly values people who do work with that value, and tends to look down at people who don't, and I think that's good…. So how much you learn on the job is very dependent on the culture of your team, and what the leaders of your team value…. [Professional identity] is something that obviously is very important that evolves during our

training and career. I think it is probably something that is less, excuse me, easily pinned down, but hopefully it is happening for everyone. (Intern 15)

It's not like we are working as an independent practitioner, by ourselves in a hospital. There's huge teams now and the multidisciplinary approach is such a big, big, I suppose, how can I say it, concept or way of practicing now. So if you're not professional and if you can't talk to people, can't communicate and can't work in a team, that will be a pretty miserable place for you. (Supervisor 13)

5.2.8 INTERNS WANT TO BE INDEPENDENT PRACTITIONERS

Interns were striving to become independent practitioners and they valued being considered and treated as such.

I think it is because you want to be a good doctor. You have patients coming in, you don't want to disappoint them, you don't want to seem inadequate, you want to be able to help them. There are people that are opening up to you. A lot of people don't open up to anyone else in their lives, now they do when they come to see a doctor. So I guess you have a responsibility to them to know as much as you can about the possible conditions they're going to come to you with, so you can give them the best care possible. (Intern 14)

I suppose being seen by, or to be able to be trusted to be safe to be left on your own too, and be efficient without being completely, completely dependent. I suppose a degree of that is being good, being okay at your job, but also being seen as performing well, like having a plan in place, like if you are a junior and you have a plan in place, and you know what you are doing, and you just need or want to quickly run it by someone, well that is good, that's being seen as competent. (Intern 15)

5.2.9 MOTIVATION TO LEARN IS MULTIFACTORIAL

The interns' motivation to learn may be multifactorial. The predominant motivations were the interns' own desire to be deemed competent and their fear of failure or doing harm.

And I suppose being seen by, or to be able to be trusted to be safe to be left on your own too, and be efficient without being completely, completely dependent…. I would not want to be incompetent. (Intern 15)

At the beginning of the year I think I said, so I don't kill people, and so far this year, so good…. You still don't want to get things wrong, you don't want to hurt people, you don't want to harm people so you are always looking things up and double checking things. I don't want to underplay that. (Intern 9)

Fear of being found to do a job badly, unfortunately is probably quite a good motivator. Fear of having a tap on the shoulder by a senior, however sweet natured or not they may be. Fear of reading in the newspaper about one of their patients that they've discharged having died with swine flu, which does happen. (Supervisor 12)

Having to pass exams to get onto college training programs was also a major driver of interns' learning.

I think one of the things that drives learning is getting onto a training program, feeling more and more pressure about that. So that's a huge motivation to go to courses and do different things, and try and make yourself more knowledgeable and competent, and I think that is a huge driver for a lot of people. (Intern 9)

5.3 SUMMARY

The results of this study suggest that learning medicine was a complex and iterative process. Additionally, Australian medical interns undertake a year-long internship that occurred in a time-poor learning environment.

It appeared that learning during internship was via a cognitive apprenticeship which included learning via apprenticeship relationships at various times and using self-directed learning at others. Situated learning, learning at the bedside or in other clinical settings, provided opportunities to observe more senior doctors and undertake practice

in a safe supervised learning environment. Teaching and learning were constructive in its approach to maximize the interns' learning, however the level of supervision was incrementally decreased over time as the interns moved along the continuum of learning towards being independent practitioners.

Interns indicated that their learning occurred via a variety of modes. They took every advantage of the apprenticeship relationships they had with their supervisors to learn, however because service provision was often prioritized over learning, interns supplemented or even ameliorated this with self-directed learning. They must therefore have been adaptive learners, able to recognize where and when learning opportunities arose and been able to use the most appropriate learning mode at any given time in order to advance their professional knowledge and skills.

Participants in this study articulated that interns must negotiate several tensions throughout their internship; learning versus service provision; administrative versus practical/clinical learning experiences; the desire to be independent versus the requirement to be supervised. Interns' motivations to learn were predominantly their own desire to be deemed competent and their fear of failure or doing harm. Interns valued interactions they had with their knowledgeable supervisors and the exposure to the cultures of medicine provided by these interactions as they strived to become independent practitioners.

CHAPTER 6 – EXPLORING THE CONCEPT OF 'APPRENTICESHIP' LEARNING

6.1 INTRODUCTION

The results of the quantitative survey data embedded with qualitative journal entries and the qualitative interview data were presented in the previous two chapters, Chapters 4 and 5. Now, in Chapter 6, a combined analysis and synthesis of the data is presented, involving triangulation of the three sets of data (Figure 3). This facilitates identification of instances of convergence and differences to broaden the understanding of the complex issue of how interns learn.

6.2 WHAT INTERNS LEARN

Supervisors articulated the belief that the goal of the medical internship was to make interns safe, competent practitioners. Interns were assigned a certain number of tasks while observing more senior doctors; they continued working and learning under supervision until they did not need that kind of safety net any more. It was also reported that interns were provided “graded exposure and graded responsibility over that time” (Intern 19) and were expected to gradually work more independently to complete tasks. To complement this, supervisors provided incrementally decreasing levels of supervision as the interns’ competence increased. However, interview responses from both interns and their supervisors indicated there was a tension between the desire to be independent versus the requirement to be supervised that the interns needed to negotiate.

Results presented in Chapters 4 and 5 indicated that medical interns’ learning was multimodal. During the interviews, interns articulated a variety of learning methods over the course of their internship. These included learning via their consultants and registrars, by seeking information or help from their peers, nurses or allied health practitioners (especially pharmacists), by talking to the patients or their families directly, or by seeking information available online through various databases. Learning via their consultant and/or their registrar was also evidenced in the learning reflection data provided by interns. In these cases, learning was almost evenly split between learning from consultants, from registrars and from application of previous knowledge, with smaller numbers reporting learning via peers and other resources. Interns indicated that the ratio of learning via their supervisors and self-directed learning changed during their internship, for example

Probably earlier in the year, my responses would reflect more people teaching me things, like a Registrar taught me this or a nurse taught me that or whatever it was, whereas later in the year, I think you do tend towards…noticing something and then reading it at home as a major learning strategy" (Intern 13).

This iterative process of learning was an essential element of the cognitive apprenticeship that occurred during an internship, as described in Section 5.2.3. Interns learnt the "tricks of the trade" from their supervisors and then mimicked this clinical practice in a safe, supported learning environment before the supervisors incrementally faded into the background and allowed the interns to develop their independence as safe, competent clinicians. All of this was apparent in the transcripts provided by both supervisors and interns when they were asked about how interns learn.

By and large, the most common belief articulated by both interns and their supervisors during the interviews was that interns learnt on the job, learnt by doing (experiential learning). Interns articulated that their learning was "Definitely hands on by doing, definitely learn by doing" (Intern 8), and sometimes used a 'see one, do one' process of learning, for example, "I think from watching and copying probably would be the main thing, so just doing what other more experienced doctors do" (Intern 19).

Interns indicated that they valued the interactions they had with their more knowledgeable supervisors. These interactions were especially important to them when they resulted in gaining knowledge and skills around the intangibles of medicine, the tacit knowledge such as how clinical reasoning works, that distinguishes members of the medical profession from other professionals in the organization. When interviewed, one common learning strategy interns articulated as desirable was a 'thinking out loud' strategy, though it was not necessarily couched in these terms. Interns spoke of the value of supervisors articulating their thinking, talking through their reasoning around how they made a diagnosis from a set of differential diagnoses and what led them to choose a particular management plan. For example;

The consultant, when we've got a new case in front of us, she could just sort of jump to conclusions and say do this, but instead she sort of thinks out loud, and I think she is closed in her thinking so that we can sort of follow where she is

going as well, kind of like a maths problem, she doesn't just jump straight to the conclusion, she'll just go step by step, and just talk through it and I find that really beneficial. (Intern 4)

The *LRS app* data revealed that on average, there were differences in the source of interns' learning i.e. who or what they learnt from in the core and non-core rotations. For example, in the core rotations, interns applied knowledge from personal experiences before they learnt from their consultants or registrars; they used their own knowledge before they utilized the learning relationship they had with their supervisors. This was confirmed during the interviews e.g. "I would keep quiet, and try and look it up in my own time and try to work it out" (Intern 14). In non-core rotations, interns learnt from their registrars telling them what to do before they learnt by any other mode. Interns' learning did not always come from positive experiences; they also learnt from negative experiences, including observations of others' bad behaviours. The interns' self-reported learning experiences indicated that there was merit in offering a combination of both core and non-core rotations throughout the internship, as they provided different experiences that were valued by the learners.

There were some gender differences in the interns' self-reported learning. Male interns recorded more individual items of learning than female interns. Female interns reported learning more via self-directed means than they did via their relationship with supervisors, whereas male interns learnt more via their relationship with their supervisors than they did via self-directed means. The reasons for this gender difference in learning was not explained by any of the interview data collected. Further research would be required to gain a better understanding of this finding.

In the interviews that were conducted in phase 3 of data collection, there was an acknowledgement by both supervisors and interns that the learning of medicine was a continuum; learning how to be a doctor starts at medical school and never ceases whilst medicine is being practiced. Learning in medicine was also complex; basic knowledge was acquired at medical school; however human illnesses do not necessarily mirror what was described in text books. For many interns in this study, the nuances of medicine were developed through supervision of their clinical practice.

As reported in Section 5.2.1, learning during the internship can be classed as iterative; it was rarely a straight forward construction of new knowledge and skills. Interns' self-

reported learning reflections in the *LRS app* showed that they alternate between various modes of learning, sometimes learning from their supervisors or other clinicians around them, sometimes learning from the patients themselves, and sometimes resorting to self-directed learning via Uptodate or other computer-based databases. Interviewed interns indicated they will continue working on their understanding of clinical presentations and management until they feel competent enough to apply this knowledge independently to new patient presentations.

The self-reported learning reflection data provided by the interns via the *LRS app* indicated that what was learnt each term was somewhat dependent on the rotations the interns were undertaking. All learning, whether it was via the apprenticeship learning relationship interns had with their supervisors or via self-directed modes, was categorized as either content, administration or professional identity. Proportionally more content was learnt in non-core rotations than in core rotations (65.7% and 56.6% respectively) and there was proportionally less administration and professional identity in non-core rotations (18.7% and 15.7% respectively) than in core rotations, (24.5% and 18.9% respectively). Each of these will be discussed in more detail in the sections that follow. Male interns reported learning more content than female interns, and the reverse was true for the learning of administration. No significant gender differences in learning were reported in the professional identity domain.

6.2.1 LEARNING CONTENT

The self-reported learning reflection data provided by the interns via the *LRS app* and reported in Chapter 4 indicated that overall, they learnt more content items (59.3%) than they did administration items (22.7%) or professional identity items (18.0%) throughout the internship year. The most common content items learnt included patient histories (8.7%), clinical knowledge (4.9%), how to examine a patient (4.7%), how to interpret investigation results (4.2%) and the correct medications to prescribe (4.2%). Male interns reported learning more content items than female interns.

The interns interviewed articulated two differing views about learning content. On the one hand, some interns felt that learning content was important, very important or even essential, and on the other hand, some interns felt that learning content was not hugely important because, rather than interns making clinical decisions, they were told what to do to manage patients' care. When answering questions about how interns learnt

whilst they worked clinically, the learning of 'content' was rarely specifically mentioned; interns spoke about learning through asking questions of 'experts' (their supervisors) including "picking their brains" or answering questions posed by their supervisors, learning through supervised practice or learning by reading around cases including follow-up reading. Interns also expressed that some learning of new knowledge occurred via formal education sessions.

Interns interviewed did acknowledge that content knowledge could be the key to success in their future careers. Supervisors interviewed felt that content was the basic knowledge required to be a doctor. In addition to having protected time for learning, interns articulated that they thought it was important for supervisors to have protected time to teach them. Whilst 'protected time' for interns was clearly articulated within the organization, tensions between service provision and learning often forced the interns to choose the care of their patients over the progression of their learning additional content via formal education sessions. The concept of 'protected time' for teaching was articulated by interns as desirable and while this was not currently available for supervisors, it was a possible solution to ensuring interns were given regular opportunities to learn.

6.2.2 LEARNING ADMINISTRATION PROCESSES

The interns' self-reported learning reflections showed that the five most common learnt items in the administration domain were what to write in patient notes (10.9%), how to write up patient charts/notes (10.7%), how to communicate with other health professionals (10.5%), where to find forms/paperwork (7.6%) and how to refer patients to other health professionals (5.3%). Female interns reported learning more administration than male interns. The reasons for this gender difference was not revealed in any of the data collected. Further research is required to gain a better understanding of this finding.

In the journal entries made on the *LRS app*, interns noted their difficulty in learning the administrative side of clinical practice, pointing out that these were not things that were explicitly learnt or taught in their medical degree at University. This sentiment was also articulated by the interns during the interviews that were conducted.

There were conflicting views on the importance of learning how to do administrative tasks. Interns articulated that they valued being efficient and identified that one of the keys to this was having good knowledge of the administrative processes. Further, interns said during the interviews that administration was the scariest part of starting as an intern because of their lack of knowledge. However, some supervisors expressed the view that interns should have this knowledge from medical school and that there was not much emphasis on this learning required during internship. This conflicting understanding of the importance of learning about the administrative processes during internship could be a possible source of knowledge debt for the interns and requires some formal solution to learning at the beginning of each of their rotations rather than relying on the ad hoc nature of learning that currently exists.

6.2.3 LEARNING PROFESSIONALISM AND DEVELOPING A PROFESSIONAL IDENTITY

As reported earlier (Section 5.2.7), part of the complexity of learning medicine is the task of learning the things that cannot be learnt from a textbook and may also be difficult for the supervisors to teach. Interns want to be immersed into the culture of medicine, to be accepted as part of the medical fraternity. To do this, they must learn what to say to sound professional, how to say or do something so they look professional and most importantly, how to think clinically. This encompasses how to use clinical reasoning to determine differential diagnoses and appropriate clinical management plans, to specifically develop a professional identity.

The self-reported learning reflection data provided by the interns via the *LRS app* determined that the most common professional identity learnt item was how to work in a team (16.8%). Interns' learning in the professional identity domain also focused on what to say to sound professional (8.1%), how to reason out differentials (7.9%), their scope of practice (7.5%) and knowing when to ask for help (5.9%). The interns' self-reported journal reflections also highlighted the importance of teams and team work to their learning. No significant gender differences in learning were reported in the professional identity domain.

Intern responses to questions asked during the interviews indicated that they valued being viewed as professional and that they might "fake it before they make it" (Intern 7). Interns articulated that they learnt professionalism by observing others and form their own professional identity by choosing good role models, reflecting on what was

observed and the reactions they elicited. Interns acknowledged that it is difficult for supervisors to 'teach' professional identity and that how individuals perceive it may be different. Consultants also expressed the view during their interviews that professional identity components are difficult, if not impossible, to teach. From this evidence, it appears that the single most important criteria for interns to learn professionalism and develop their professional identities is to have good role models.

6.3 APPRENTICESHIP VERSUS SELF-DIRECTED LEARNING

The *LRS app* data clearly showed that interns learnt via both apprenticeship relationships and via self-directed means at various times, and interns articulated that what they were doing was "maximizing every situation as a learning situation" (Intern 7). Interns' self-reported learning reflections indicated that 52.7% of what they learnt was via the learning relationship they had with their clinical supervisors. Interview responses indicated there were several reasons why this percentage was not higher. Firstly, interns are first and foremost required to be part of a service provision team for the organization, with learning occurring when and where possible. Additionally, the interns' supervisors were also pressed for time as they balanced organizational demands with their patients' clinical needs. As a result, the supervisors indicated that intern learning during internship was not solely via a learning relationship between themselves and their interns because of those demands.

Secondly, according to interview responses from both interns and their supervisors, interns must negotiate the tension between the organizational requirement for them to be 'paper-pushers' (completing administrative tasks) versus gaining practical/clinical learning experiences. The clerical/administrative duties for clinical teams was often a role that fell to the interns and this paper-pushing often had to be prioritized over opportunities to learn via practical/clinical learning experiences.

Thirdly, interns desired to be considered competent, independent practitioners. With this status, interns would have the appropriate knowledge and skills to provide safe patient care, to be responsible for the management of their patients' healthcare journey without constant direct supervision. However, interns were only provisional registrants with the Medical Board of Australia which, by definition, required them to be supervised at all times (Australian Medical Council, 2013, p. 8). This was a tension that interns

had to negotiate and manage carefully to ensure that they were given appropriate opportunities to learn and work towards being independent practitioners without compromising patient safety.

As reported in Section 5.2.3, learning during a medical internship appeared to be via a cognitive apprenticeship which consisted of both supervised and self-directed learning. For interns, the cognitive apprenticeship naturally involved incremental decreases in learning via the apprenticeship relationship with their clinical supervisors as they assumed more clinical responsibility, and a corresponding increase in self-directed learning. Interns reported that they took every advantage of the apprenticeship relationships they had with their supervisors to learn. However, because service provision was often prioritized over learning, they supplemented this with self-directed learning. The interns' self-reported learning reflections indicated that while managing the first case of each day during the first week of each term, almost half of their learning was by self-directed means. Much of this was by application of previous knowledge, although other significant contributors were learning from peers, from online resources, and learning from the patient, patient's family and other health care providers. It was therefore accepted by the organization that medical interns never learnt solely via the apprenticeship relationship they had with their supervisors. As a result, interns had to be adaptive learners, able to recognize where and when learning opportunities arose and able to use the most appropriate learning mode at any given time to advance their professional knowledge and skills to become independent practitioners. It was interesting to note that there was no consensus amongst the supervisors and interns who were interviewed as to who the 'master' was in the interns' learning relationships. Interns took advantage of the expertise of other members of the multi-disciplinary team such as the pharmacists when and where necessary to supplement or enhance their medical knowledge.

In interviews, interns indicated that their internship was often undertaken in a time-poor learning environment. As reported in Section 5.2.5, interns were first and foremost required to be part of a service provision team for the organization, with learning occurring when and where possible. Clinical supervisors were also time-poor when it came to teaching and learning, as they balanced organizational demands and their patients' clinical needs with the requirement to provide supervised practice for the interns working in their team. Interns needed to be adaptive learners, adapting their learning to take advantage of opportunities to learn if, and when they arose. Therefore,

if learning via apprenticeship relationships was not available, interns used self-directed modes of learning to advance their knowledge and skills towards being independent practitioners.

6.4 INTERNS' MOTIVATIONS TO LEARN

Data that provided evidence of what motivated interns to learn was available from the qualitative data in the journal entries (from the online *LRS app*) and the semi-structured interviews. The majority of the journal entries provided by the interns contained elaborations of their self-reported learning and very few articulated their motivations to learn. Those journal entries that did include comments about why the intern learnt the way they did, revealed that motivation to learn included fear of missing something that could result in a bad outcome for the patient. This could be interpreted as a fear of not being competent enough to identify all the patients' health issues. The interview responses certainly indicated that fear in a number of forms was a major driver of interns' learning and this included a fear of doing harm to patients.

Interns also articulated in their interview responses that a fear of looking silly or stupid often drove their learning. In a similar vein, interns indicated in journal entries that observing other clinicians' bad behaviour towards staff and/or patients was an impetus for them to learn to behave differently. The other drivers of interns' learning identified during the interviews included being considered a competent and independent practitioner who can be trusted to be safe and achieve good outcomes for their patients and having a competitive edge to get in to specialist college training programs.

6.5 SUMMARY

This chapter has brought together the different strands of data presented in Chapters 4 & 5 and discussed important findings from this study. Medical interns' self-reported learning reflections indicated that a little more than 50% of their learning occurred via the apprenticeship learning relationship they had with their supervisors. The other portion of their learning, a little under 50%, occurred via self-directed learning. This was congruent with a cognitive apprenticeship where supervisors incrementally

decreased their level of supervision and teaching as the intern increased their knowledge and skills towards being an independent practitioner. Interns valued the interactions they had with knowledgeable supervisors but needed to be adaptive learners to recognize and take advantage of both apprenticeship and self-directed learning opportunities if, and when they arose.

Learning medicine IS complex because human illnesses do not necessarily mirror what is described in text books. Interns must translate what they have learnt in medical school to providing safe patient care. To do this, they must learn on the job, learn by doing. Clinical supervisors in this study provided their interns with supervised practice which entailed graded exposure and graded responsibility over that time until the intern was able to work independently. Learning during the internship was iterative in that it was rarely a straight-forward construction of new knowledge and skills. To further complicate learning, interns had to negotiate a number of tensions, including service provision versus learning, completing administrative processes versus taking learning opportunities involving clinical/practical experiences, and balancing the desire to be independent versus the requirement to be supervised.

Interns learnt aspects of content, administration and professional identity during their internship year, however the details of what was learnt differed from rotation to rotation. Interaction with supervisors was especially important for interns to learn the aspects of medicine that were difficult, if not impossible to teach. This included learning the tacit knowledge and skills that enabled them to be accepted members of the medical fraternity, knowledge and skills such as how to say or do something so that they look professional and most importantly, how to use clinical reasoning to determine differential diagnoses and appropriate clinical management plans.

Intern interviews indicated that their motivations to learn were multifactorial and included a desire to be deemed competent, however fear of failure or doing patients harm were the most common drivers of interns' learning. Interns also indicated that observing other clinicians' bad behavior was an impetus for them to learn to behave differently. Lastly, studying to get in to college training programs was also a priority for many of the interns who were interviewed.

In this study it was clear a substantial amount of intern learning was via some sort of apprenticeship. Further studies are needed in other contexts to see if this is

generalizable to other interns and other jurisdictions, however this study has contributed to understanding the complex factors around how and what interns learn.

This and the previous two chapters have presented the findings of this study. The last chapter of this thesis, Chapter 7, will present the discussion, strengths and limitations, educational implications and conclusions.

CHAPTER 7 – DISCUSSION & CONCLUSION

7.1 INTRODUCTION

Traditionally, the medical internship year in Australia has been a year of supervised practice (Paltridge, 2006). However, the landscape of medicine has changed greatly. Exponential growth in the development and use of technology in medical sciences means that knowledge of diseases, coupled with how patients are diagnosed and treated, is vastly different. Patients admitted to hospital in 2015 were, on average, much sicker with more co-morbidities and had a much shorter stay than they did when medical internships were first introduced (Australian Health Ministers' Advisory Council, 2015a). This puts greater pressure on today's junior doctors to 'manage' patients in a way that is both timely and cost-effective. It therefore stands to reason that the learning that occurs in the medical apprenticeship has also changed (Australian Health Ministers' Advisory Council, 2015a). The 81% increase in domestic medical graduates from 1348 in 2005 to 2442 in 2012 (Joyce et al., 2007) has created additional pressure on accredited terms to provide quality training for interns (Brazil & Mitchell, 2013). With this increase, there has been a dilution of learning opportunities (fewer patients per intern) (Brazil & Mitchell, 2013) and an increase in pressure and strain on the supervisors of 'apprentices' (Eley et al., 2008; Sen Gupta et al., 2008).

This mixed methods study aimed to investigate how medical interns learn in the 21st Century, by addressing the following questions:

- from whom or from what do interns learn and what specifically do they learn via these encounters;
- to what degree do interns still learn via an apprenticeship model, if at all, and how much of an intern's learning is self-directed; and
- what drives interns' learning in these directions?

This chapter will synthesize all the evidence that has been collected in this study to answer these questions. Findings will also be considered in light of the relevant literature.

7.2 HOW INTERNS LEARN

For the purposes of this study, 'apprenticeship' learning was defined as any learning that occurred as a result of the relationship interns had with their supervisors, their consultants and/or their registrars. All other learning was classified as 'self-directed' or

learning that was not directed by the interns' supervisors. Interns' self-reported learning reflections indicated that interns learnt by both the apprenticeship relationship with their supervisors (52.7%) and via self-directed means (45.9%) including the use of previous knowledge (personal experience, university knowledge, hospital education session, tutorial, lecture), learning via peers (other junior doctors), via the patient and/or patient's family, nurses and allied health practitioners, or via other resources.

There was consensus amongst participants that the internship year still involved supervised learning with decreasing levels of supervision and corresponding increased levels of autonomy and responsibility. The results of this study showed that it was still essential for interns to learn from supervisors and more than half of their learning still occurred in this way. Developing skills such as how to examine a patient, how to interpret investigation results, what to write in patient charts/notes, how to write up patient charts/notes, how to reason out differential diagnoses and what to say to sound professional all required input from more senior medical clinicians and effective learning about these could not be gained using self-directed means.

Analysis of the data collected for this study showed that the way interns learnt varied from rotation to rotation and indicated that not all rotations were the same in the learning experiences they offered the interns. For example, interns had a closer learning relationship with their supervisors in medicine and non-core TTH units than they did with their supervisors in surgery and community-based units. This was perhaps partly a product of the clinical environments and the way in which the units worked; surgical consultants and registrars were often required to conduct long theatre lists rather than spend a lot of time in wards, and community-based units often offered clinic-based rather than ward-based patient care. The final report on the review of medical intern training (Australian Health Ministers' Advisory Council, 2015b) found that the best supervision interns experienced was in emergency care and GP rotations, however the results of the current study suggested otherwise. The reported apprenticeship learning in these two units during the two-year study (50.7% and 45.2% respectively) were below the overall average (52.7%). This would suggest that it is difficult to generalize levels of supervision and that it could be very much dependent on the teams in the rotations rather than the nature of the rotations themselves pre-empting the intensity and quality of supervision.

It was difficult to determine from the evidence collected in the study if the differences in the apprenticeship learning identified across the various rotations had detrimental effects on the interns' learning. However most of the journal entries made by the interns indicated that all learning they had experienced, including negative experiences, were valued by them. The final report on the review of medical intern training (Australian Health Ministers' Advisory Council, 2015b) noted that there has been a "narrowing and diluting of the learning experience….all the way through the training pipeline" (p. 15) and that "the variability in supervision …is a significant weakness of the current model [of intern training]" (p. 16). The report also noted that "over-protective supervision can restrict intern activities to a very narrow range, impeding the learning process that is essential for the development of capable, confident doctors" (p. 16). There needs then to be a happy medium of supervision with appropriate self-directed learning opportunities to maximize interns' learning. More research is required to determine the ideal model. Results of this study suggest that it would not be a one-size-fits-all model for all clinical settings and rotations.

A variety of self-directed modes of learning were reported to have been used by the interns in this study, however most of the self-directed learning involved the application of previous knowledge. This was perhaps not surprising considering that interns are adult learners and as such, it would be expected that they would use their own experiences and knowledge-base in learning something new (Knowles, 1980). The self-directed learning activities reported by the interns in this study were more likely evidence of the interns diagnosing their own learning needs and pursuing professional development opportunities outside the apprenticeship relationships they had with their supervisors. This is an example of the interns pursuing their need as adult learners to learn on their own (Houle, 1988; Tough, 1967, 1971).

The interns' use of self-directed learning modes could also be seen as interns taking some responsibility for their own learning; since it was impossible for the interns to be supervised by the consultants and registrars at all times during each shift, it was important for interns to use other forms of learning to ensure continuity of care for their patients. Using self-directed learning activities showed that the interns were developing the life-long learning skills that will be necessary for them to meet the changing needs of their patients over time (Spencer & Jordan, 1999). Additionally, evidence collected in this study showed that supervisors modeled clinical work for the interns, supported the interns through their attempts to become competent and then

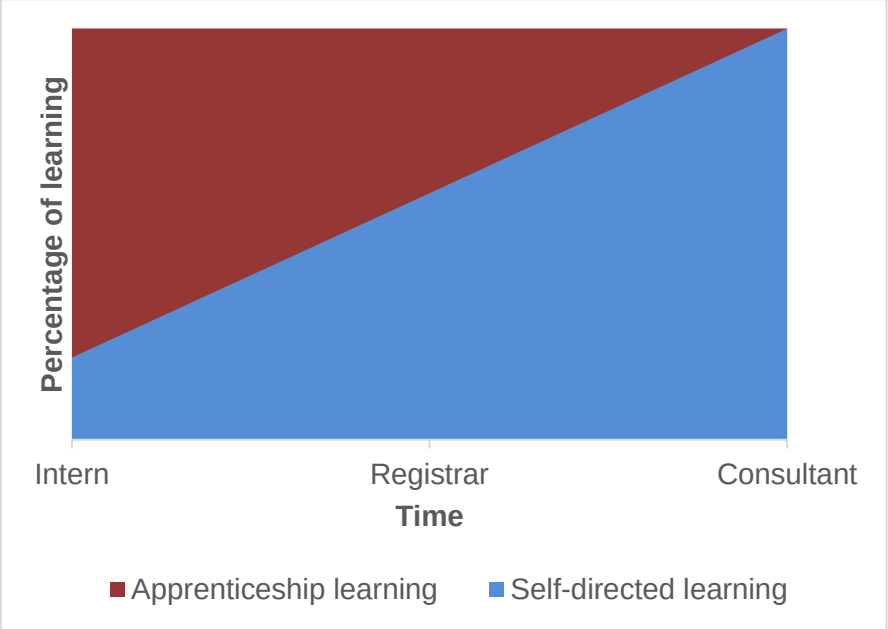
faded into the background when no longer required for coaching, giving the interns greater levels of autonomy and responsibility. This aligns with the concept of a cognitive apprenticeship as outlined below.

A cognitive apprenticeship

The idea of cognitive apprenticeships being used in the medical education domain was first put forward by Stalmeijer and colleagues (2013) as a clinical teaching method. The advantage of this model is that it provides supervisors with the opportunity to model and create safe learning environments. Learning that occurs is via a 'model' who "can perform the activity acceptably in the real world" (Farmer, Buckmaster, & LeGrand, 1992, p. 72). Stalmeijer (2015) went on to suggest that the teaching methods of cognitive apprenticeships "adhere to the traditional apprenticeship principles" (p. 355) but allow a shift of focus for the learner from learning by observation to learning through guided practice.

However, a cognitive apprenticeship consists of the use of both supervised or guided practice and self-directed learning, with the proportion of each changing over time. The apprenticeship often begins mostly with the learner being guided by their more knowledgeable supervisors; very little of their learning is self-directed at this stage. As the learner becomes more knowledgeable and capable, this support is slowly withdrawn and the learner utilizes more and more self-directed learning modes to replace the apprenticeship learning. This shift from learning via apprenticeship relationships to self-directed learning will continue to occur throughout the medical learning continuum until the doctor becomes a fully independent practitioner, i.e. the specialty consultant. Figure 13 has been developed to illustrate how this learning transition may occur over time.

Figure 13: Schema illustrating the proportions of apprenticeship and self-directed learning over time in a cognitive apprenticeship



The key benefit of a cognitive apprenticeship is that it helps adult learners such as the interns to perform what Brant, Farmer and Buckmaster (1993) called the "ill-defined, complex and risky tasks" (p. 77). In a clinical setting, this cognitive apprenticeship helps control the level of risk and complexity of tasks as the interns learn and become more confident and competent with clinical tasks. From this point of view, this part of the 'apprenticeship' learning must essentially be from a more senior, more experienced medical clinician.

One of the biggest conundrums around the interns' learning was defining who was actually supervising their learning, that is, who the 'master' was in the learning relationship. Good supervision is essential in guiding interns and maximizing their learning (Rudland et al., 2010). Analysis of the interviews indicated there was no clear definition of who was or who should be considered qualified to provide appropriate supervision for the interns' learning. Consultants felt that they were the masters. Registrars felt that ideally the masters should have been the consultants, but in most cases, it was more practical for them to be the supervisors of clinical learning. However, supervisors and interns acknowledged that some valuable things can be learnt from the nurses and allied health practitioners. In this current study, participating interns conveyed varying opinions on who it was they looked to for their supervised learning, ranging from any doctor who was more senior to them (even doctors who

were only one year their senior) to nurses and allied health practitioners. This lack of clarity of who the supervisors of interns' learning should be was perhaps where the concept of the medical apprenticeship became fragmented and therefore ill-defined.

Evidence from this study demonstrated that interns learnt via cognitive apprenticeships. There were clear examples of individual interns learning via varying amounts of both apprenticeship and self-directed learning during the first week of each term; interview transcripts contained evidence of individual interns citing learning experiences that moved through the various phases of the cognitive apprenticeship (modeling, approximating, fading, self-directed learning and generalizing). If the concept of a medical cognitive apprenticeship is accepted, then all learning experienced by the intern, including self-directed learning, is part of the apprenticeship. To ameliorate the current fragmentation of the medical apprenticeship, there are three strategies for improving teaching and learning for the intern that could be considered. Firstly, the principles of the cognitive apprenticeship need to be made explicit to clinical supervisors to ensure that they have the capacity to operationalize all aspects and therefore maximize the development of the interns towards being independent clinicians. Secondly, Stalmeijer et al (2013) suggest that rather than there being one 'master' who has the sole responsibility for the interns' learning, teaching within the cognitive apprenticeship could be a team responsibility. Consultants, registrars, junior doctors, nurses and allied health practitioners can complement each other's knowledge and skills to create a strong clinical teaching environment for the intern. Research shows that interprofessional education (IPE) is important in healthcare as it "offers a possible way to improve interprofessional collaboration and patient care" (Reeves, Perrier, Goldman, Freeth, & Zwarenstein, 2013). The effectiveness of IPE in healthcare has been shown to be statistically significant (Guraya & Barr, 2018). In a UK study conducted by Vallis, Hesketh & Macpherson (2004), nurses openly acknowledged that they often took on a role of providing informal support and guidance to PRHOs as they believed that they had the knowledge and skills to do so. Whilst this already occurs to some degree in clinical settings in Australia, the formalization of a much broader teaching structure would optimize the learning for the intern and should drive more productive interprofessional communication and collaboration. Lastly, interns need to be motivated and proactive in their approach to learning (Sheehan et al., 2010) for clinical supervisors to apply the various phases of the cognitive apprenticeship (Stalmeijer et al., 2013). Therefore, interns need to be equipped with 'internship survival skills' that include effective communication, development of

learning objectives, time management skills and skills for receiving feedback (Stalmeijer et al., 2013).

Adaptive learners

Interviews of interns and their supervisors revealed that interns learn in a very time-poor learning environment. Evidence showed that this was as a result of a combination of the interns' service provision role in the organization and the organizations' demands of their supervisors' time. In the context of a cognitive apprenticeship, interns need to be adaptive learners; they need to able to adapt their learning to take advantage of opportunities to learn if and when they arise. If learning via apprenticeship relationships is not available all of the time, they must be able to adapt to employ other self-directed modes of learning to advance their knowledge and skills towards being independent practitioners. The concept of 'adaptive learning' was developed for computer-based or online education to enable learners to be presented relevant education, so that each learner could choose content according to their learning needs and therefore progress at an appropriate rate for them (Skinner, 1958). The notion of medical interns being adaptive learners has been introduced here as a way of describing the process of interns identifying their learning needs and tailoring the learning to those needs. Interns need to be educated about the skills they will require to be effective adaptive learners. These could be part of the 'internship survival skills' outlined above.

Negotiating tensions

Interviews with supervisors and interns identified three tensions that the interns must negotiate: i) learning versus service provision; ii) paper-pushing rather than opportunities for practical/clinical learning experiences; and iii) the desire to be independent versus the requirement to be supervised.

The current workloads of interns are governed more by service provision than by their learning needs. For this to change, there would need to be a shift in the focus of the purpose of interns in the organization. If the focus became one of learning, interns would have the opportunity to follow a patient through their entire hospital journey and there would be no time limits placed on interns to work up their patients; there would be more time for "learning by doing". For this concept to be adopted, there would need to be major changes to workforce planning and recruitment in hospitals to allow the interns this luxury of time. Hospitals would need to recruit more interns or more junior doctors to provide the same level of health care coverage that currently exists. One

would imagine that if interns were allowed to be involved in the patient's entire hospital journey that learning experiences would be enhanced, however, it would mean that interns would be exposed to fewer patients and therefore a narrower casemix. This may not be such an issue if the intern was provided with opportunities for deep learning on the cases they do manage, as some learning can be generalized to other cases. The internship would then concentrate on the quality of learning over the quantity of learning so that interns have a good understanding of the cases they worked on and are able to apply this knowledge across other cases.

Participants in this study were critical of the amount of administrative and clerical work required to be done by the interns, as it reduced the time they were able to undertake other clinical work and therefore expand their clinical knowledge and skills, their professional craft knowledge (Higgs & Andresen, 2001). This was apparently not just a local experience, as the final report of the Australia-wide review of medical intern training noted that "shorter lengths of stay and correspondingly higher patient turnover have generated a greater volume of administrative tasks for interns to perform" (Australian Health Ministers' Advisory Council, 2015b, p. 14). The report suggested there needs to be a better balance between "the important administrative aspects of care" and interns developing and using "clinical reasoning and judgment" as part of the full range of activities interns undertake to support their learning (Australian Health Ministers' Advisory Council, 2015b, p. 36). There needs to be more research conducted to determine which aspects of the interns' administrative duties could be transferred to other healthcare workers within the organization. This concept of 'task shifting' has been gathering momentum over the past decade or so. The first global conference on task shifting was held in Ethiopia in 2008 to address the shortage of healthcare workers trying to stem the HIV/AIDS pandemic. The World Health Organization defined task shifting as the "process of delegation whereby tasks are moved, where appropriate, to less specialized health workers" (World Health Organization, 2008). The purpose of task shifting is to make better use of the human resources available and to improve the overall healthcare coverage. The one concern with using this strategy is that it could 'deskill' the interns by taking away their first-hand awareness of what is happening with their patients and therefore take away their ability to be first responders to changes in their patients' conditions (Vallis et al., 2004). It could also limit their working knowledge of the health system processes and the importance of patient safety and quality.

The interns' desire to be independent practitioners and the requirement set down by the Medical Board of Australia for them to be supervised at all times (Australian Medical Council, 2013, p. 8) is a difficult balancing act. Patient safety must be paramount, and the safety of the interns must also be prioritized. If supervisors are able to put the cognitive apprenticeship into action, interns have a better chance of being able to learn through guided practice in a way that is safe for them and their patients. During the coaching phase of the cognitive apprenticeship, supervisors can provide a scaffold of support in the form of reminders and help to ensure that the intern is competent, before that support is withdrawn when supervisors fade into the background (Collins, Brown, & Newman, 1989). To reduce the interns' tension over independence versus the requirement to be supervised, the principles of the cognitive apprenticeship need to be made explicit to clinical supervisors to ensure that they have the capacity to operationalize all aspects and maximize the development of the interns towards being independent clinicians.

How interns learn

This study set out to investigate interns' learning and determine if "the learning environment [was] less personal, …. captive to self-directed learning" as Van Der Weyden suggested in his *Medical Journal of Australia* Editorial (2006, p. 313). Evidence collected during this study suggests that the medical interns' learning environment is still dominated more by the personal learning relationships they have with their supervisors (consultants and registrars) than it is by self-directed learning. Evidence collected also suggests that the interns' use of self-directed learning is a natural progression within a cognitive apprenticeship as they work towards becoming independent practitioners. Self-directed learning is important to the growth of medical interns' professional knowledge and skills and it is also an essential life-long learning skill that will be required to maintain their professional craft knowledge throughout their years of medical practice.

What interns learn

Interns in this study learnt more content than administration or professional identity items throughout their internship year. Most of the content learnt was explicit or propositional knowledge in the field of medicine that can be easily taught or found in literature. There was an assumption by the supervisors that interns would have learnt quite a lot of this content whilst at medical school and that the internship was the opportunity for them to put this knowledge into practice. However, the results of this

study show that the interns continue to learn propositional knowledge throughout the internship year. Therefore, it is important that interns are supported in their quest to expand their propositional knowledge through providing and enforcing protected time for attending formal education programs and supporting regular self-directed learning time.

However, propositional knowledge is only part of the professional practice knowledge or professional craft knowledge required by doctors to be competent. The other essential part is tacit knowledge, knowledge gained from personal experience (Higgs & Andresen, 2001). Many of the learnt items interns identified in this study that might be considered tacit knowledge fall within the administration and professional identity domains of learning, for example, how to work in a team, how to prioritize, what to say to sound professional, how to reason out differentials. This is knowledge that cannot be easily taught, and the supervisors were certainly aware that this was the case.

Transferring tacit knowledge requires a clinician with knowledge from real-world experiences (the supervisors) to show the interns how to perform clinical tasks (model) and/or work clinically and talk out loud while they are doing it, perhaps including the "tricks of the trade" (Brandt et al., 1993). Articulating thinking ("thinking out loud") while modeling the tasks interns need to learn is particularly important when the supervisors are working with patients during ward rounds. It is important for supervisors to articulate how they develop differential diagnoses and develop management plans so that interns learn the nuances of clinical thinking/reasoning. It is well accepted that registrars have "a central role in….facilitating the teaching and learning experience of junior staff in hospitals" (Confederation of Postgraduate Medical Education Councils, 2003, p. 13). However, whether the interns' supervisors are at a consultant or registrar level, interns require supervisors to articulate their thought processes and explanations of the reasons for the clinical decisions they make in order to develop their own clinical skills and learn how to use clinical reasoning themselves. This is an essential part of a cognitive apprenticeship; however, interns indicated that supervisors were often time-poor and therefore missed opportunities for this type of knowledge transfer to occur. One solution to this would be for supervisors to be given a portion of 'protected teaching time' each week.

There was also transfer of tacit knowledge identified by interns when they observed more senior doctors' behaviours, explicitly behavioural modeling (Bandura, 1977)

where interns learnt what to say to sound professional, what to do to look professional, and so on. Not all of this modeling was of good behaviour, however this still presented valuable learning of what interns articulated as ‘what not to do’.

Phase 4 of a cognitive apprenticeship involves self-directed learning (Section 1.1). It is the internalization phase where the interns are able to successfully carry out the tasks learnt via Phases 1 – 3 and practice these skills within their scope of practice (Brandt et al., 1993). There was evidence in this study of interns going through this stage of the cognitive apprenticeship and they also spoke of the value of in-depth discussions with their supervisors in order to generalize what they had learnt to other cases (Phase 5).

Rotations offered to the interns in this study included the core rotations, other non-core rotations based in the hospital, community-based unit rotations, small rural hospital rotations, private hospital rotations and General Practice rotations (via the Prevocational General Practice Placement Program). It is safe to say that this wide range of clinical settings provided the interns with different learning experiences and that together, they provided a broad range of clinical experiences from which the young medical professionals could build their professional craft knowledge.

Whilst there were some commonalities of learnt items from rotation to rotation, interns did report different emphases of learning in different rotations. The final report on the review of medical intern training questioned whether the mandatory (core) terms provide general experience (Australian Health Ministers' Advisory Council, 2015b, p. 19). Notably in this study, interns reported little difference between the learning that occurred in the core rotations (medicine, surgery and emergency medicine) and the non-core rotations. This appears to indicate that the core terms did in fact provide general experience for the interns.

Interns working within the Townsville Hospital and Health Service, and therefore the interns participating in this study, were provided with opportunities to tailor their learning in a number of ways. Firstly, interns were required to negotiate their scope of practice with their clinical supervisors at the beginning of each rotation. Ideally this scope of practice was renegotiated throughout the term and expanded over time to increase their levels of autonomy and responsibility as they became more competent

and confident in the care of patients. Secondly, interns were required to accrue 100 CME points for 'extra-curricular' learning activities. This system of CME points for interns was developed at this facility (Agnew & O'Kane, 2011). It presents interns with the opportunity to set learning goals that are relevant to their intended career directions, undertake professional development that provides them with enhanced knowledge and skills or fills knowledge gaps, and allows them to choose learning activities that suit their learning styles, all at times that are most suitable for them. Essentially, the interns are treated as adult learners, with the CME points system providing them with opportunities to take responsibility for their own learning rather than the facility imposing inflexible learning programs that may or may not be relevant to their learning needs. Tailoring the learning in this way "recognizes the accountability of the individual in managing their own learning" that has been recommended in the final report on the review of medical intern training (Australian Health Ministers' Advisory Council, 2015b, p. 46).

One other important aspect of the interns' learning warranting discussion is how interns learn to provide safe patient care. The concepts of 'safe patient care', 'practicing safely' and 'patient safety' were interwoven throughout participant responses. These concepts are inextricably linked to the premise of what a medical apprenticeship is and how it works, that interns work under supervision until they do not need "that safety net any more" (Supervisor 13). The Confederation of Postgraduate Medical Education Councils believes that the responsibility for safe, high quality care is a shared responsibility that "requires a strong inter-professional team culture". Further more, they believe that "it is important that the teaching of safe patient care is vertically integrated into medical education from undergraduate to prevocational and through to vocational training" (Confederation of Postgraduate Medical Education Councils, 2012, p. 2). It was difficult to tell from the study results if a strong inter-professional team culture existed in all the clinical settings experienced and reflected on by the interns. It is likely that inter-professional team cultures are stronger in some clinical settings than others, however this may depend largely on the interpersonal styles of the individuals involved. The responses made by study participants appeared to indicate that the teaching of patient safety may not be a coordinated approach, that teaching may have occurred on an 'as needed, where needed' basis. To add to the complexities surrounding the maintenance of safe patient care, research has shown that the timing of when supervisors entrust interns with unsupervised tasks is not generalizable, but requires consideration of each individual's past performances and ability to deal with

the entrusted task (Sterkenburg, Barach, Kalkman, Gielen, & ten Cate, 2010). More action-research is required to understand the existing inter-professional culture of various clinical settings and how the teaching of safe patient care occurs.

7.3 WHAT DRIVES INTERNS TO LEARN THE WAY THEY DO?

Interns aspire to be competent, confident and ultimately autonomous medical practitioners. However, the internship is just the first step on their journey to realize this aspiration. The reality is that it can take six to ten years, or even more, to reach the point where they might be considered independent practitioners, usually recognized through fellowship of a specialty college. Even then, their learning should never stop if they are to maintain currency of knowledge of the science of medicine, the skills required to put this into practice and to know how to use the technology that supports practice. It is essential that they have intrinsic motivation to learn and can react to extrinsic motivators when required.

There were a number of motivators for interns to learn identified by participants in this study. Other people's perceptions were identified as very strong intrinsic motivators for interns to learn. This was manifested as an intern being considered a good, safe doctor who was able to achieve good outcomes for patients and conversely, an intern having a fear of doing harm to patients or a fear of looking silly or stupid, especially in front of colleagues, patients and students.

Perhaps the most important extrinsic motivators for interns' learning during their internship were the mid-term appraisals and end of term assessments of their performance. While these were completed by the intern's supervisors, there may have been input from all members of the multidisciplinary teams with whom the intern worked. These extrinsic motivators can trigger the intrinsic motivators (Deci et al., 1999) of being considered competent and independent practitioners and the fear of failure. The fear of failure, while disregarded by some supervisors, was real. Interns knew that some of their colleagues had failed rotations, that they could be failed, and that this could affect their ability to gain General Registration and progress into the next level of training.

Perhaps the second most influential extrinsic motivator of interns' learning identified by study participants, both supervisors and interns, was the process for progressing careers. This was conceptualized as having the knowledge and skills to pass exams and having a competitive edge over peers to get onto college training programs in the future. In order to achieve this, interns have to be either self-motivated to learn, or be provided with a system that facilitates this type of learning. The requirement for interns to provide evidence of ongoing 'extra-curricula' professional development throughout internship can be an extrinsic motivator and a subsequent intrinsic motivation trigger (Deci et al., 1999) to learn what is specifically relevant to an individual intern's preparations towards their chosen career pathway.

A CME points system is used by many professional colleges to encourage their Fellows to undertake and monitor their own professional development, and also to assist them in developing the required learning habits and behaviours (Dent, Weiland, & Paltridge, 2008; Goodyear-Smith, Whitehorn, & McCormick, 2003). The role of any continuing medical education (CME) is to provide learning that can be translated into practice. However, attending or participating in CME does not necessarily mean that the doctor is a better practitioner (Goodyear-Smith et al., 2003). Interactive sessions appear to be more successful in changing practice behaviours. Other less formal activities such as reading, using the Internet, collegial conversations and letters from specialists are all valid forms of CME that tended to be marginalized. These less formal activities are the reinforcers of knowledge, the 'brief intervention strategies' that may be required to effect behavioural change. A study originating from the Royal New Zealand College of General Practitioners' transition to compulsory CME for re-accreditation and registration of its members, was carried out to ascertain general practitioners' (GPs) perceptions of the role that CME plays in changing behavior (Goodyear-Smith et al., 2003). This phenomenological study used motivational interviewing theory as the basis for the intervention used. This theory works through a series of brief intervention strategies designed to help participants see the need for change and therefore motivate them into changing their behaviour. The study involved semi-structured telephone interviews with 24 GPs from geographically diverse practices. The study found that:

- GPs need to engage in a lifelong process of CME to maintain currency of knowledge and practice;

- behaviour change is an evolutionary process requiring reinforcement from different sources and that a single event is unlikely (but not impossible) to change a GP's practice; and
- there are strong negative feelings about the CME system of collecting points.

The study concluded that behaviour changes are most likely to be incremental and therefore, multi-faceted learning opportunities need to be considered in the development of CME activities provided by colleges and other CME providers (Goodyear-Smith et al., 2003).

As mentioned previously, a CME points system for interns has been used by the facility in which this study was conducted since 2010. The CME points system was designed as an extrinsic motivator that can trigger the learner's intrinsic motivation (Agnew & O'Kane, 2011). Essentially the CME points system used by the interns in this study provided flexible learning options; interns are able to participate in face-to-face formal education sessions, online learning, skills workshops, or they are able to undertake research in the form of audits, quality assurance activities or pure research activities and have their published work and/or presented work recognized. The CME points system encouraged interns to learn what they felt was important, relevant and/or useful for their current and/or future careers. The CME points system keeps authoritarianism to a minimum and allows learners to make all of the choices of what they want to, or need to learn in order to meet their career goals (Deci et al., 1994). Often this was to assist them in achieving a place on a specialty training program. In a way, the CME points system provides a framework for learning, while encouraging the development of the self-directed learning skills necessary for life-long learning and the subsequent challenge of meeting the changing needs of patients (Spencer & Jordan, 1999).

7.4 STRENGTHS AND LIMITATIONS OF THIS STUDY

The principal researcher of this study was the Principal Medical Education Officer (PMEO) in the hospital at which the interns in this study were employed. The role of the PMEO is to facilitate learning opportunities for interns and to monitor the standard of clinical bedside supervision and learning for the interns. The PMEO's role therefore is predominantly one of advocacy for the interns, having no influence over the assessment of an intern's performance. However, every reasonable effort has been made in providing interns with anonymity to avoid the perception of any conflict of

interest or bias; this has been described in the text of this thesis. Whilst the fact that the principal investigator was a PMEO could be seen as a limitation due to a number of potential biases, it could also be seen as a strength in this study, as the qualifications and professional experience the PMEO had provided a particular professional lens through which interns and their learning environments could be viewed.

Another strength in this study was that the interns had a strong role in designing, refining and piloting the instruments used to collect data for this study. This provided interpretive validity, allowing the research participants to be actively involved in determining the language used in the tools in an effort to ensure that the terms used "accurately portray[ed] the participants' meanings about what [was] being studied" (Johnson & Turner, 2003, p. 300).

The use of a convergent parallel mixed methods study design also strengthened the robustness of the results of this study. Although the quantitative and qualitative data sets were collected and initially analyzed independently, merging of the data sets allowed triangulation of the data. This involved cross verification of the quantitative and qualitative data, therefore facilitating validation of the results.

The main limitation of this study was that it was conducted with two intern cohorts who were employed by the one health service only. However, since all intern terms across Australia are accredited against the national standards set by the AMC and the Medical Board of Australia (Australian Medical Council, 2013), it was reasonable to assume that there were similarities in interns' learning experiences from one Australian health facility to another. With the participation rate of interns being only 45% of the total number of interns undertaking their internship within the Hospital and Health Service, generalizability to the learning of all Australian interns should be undertaken with caution. However, as participating interns recorded their learning reflections from clinical experiences within a wide range of clinical settings including a large tertiary hospital, a private hospital, community-based health settings, small rural hospitals and general practice settings, the data may provide some insights into interns' learning experiences more broadly.

Another limitation was that this study assessed self-reported learning rather than actual learning; there was no way of knowing how close the learning reflections provided were to actual learning, however the data collected were expressions of the

interns' reality. One other thing to consider is the fact that there are a number of learning theories which necessitate the learner taking time to reflect as being central to the learning process (Kolb, 1984; Schon, 1983). However according to Eraut, "when time is extremely short, decisions have to be rapid and the scope of reflection is extremely limited" (1994, p. 145). Interns indicated in their learning reflections and in the interviews that they work in a time-poor learning environment, therefore being involved in this study may have provided the interns with impetus to learn more than they might have if they had not had the opportunity to reflect on their learning.

The definition of apprenticeship learning used for this study was an over simplification and this is a limitation that must be considered. In reality, things are not so neatly dichotomized. However, since this study focused on the learning relationship interns had with their supervisors, the definition used provided data that was relevant to this concept.

A further limitation was that there was some risk of data bias in asking the interns to only reflect on their learning from managing the 'first case of each day' of the first week of each term. Choosing the 'first case of the day' was an arbitrary choice; it could easily have been the 'last case of the day' that was chosen for the study. However, it was thought that there was a stronger likelihood of the interns completing their management of the 'first case of the day', so the decision was made to incorporate this methodology for the study. The problem in choosing the 'first case of the day' is that realistically, the 'first case of the day' could quite likely have been the first patient of a morning ward round. There was always a possibility that the most urgent case or the sickest patient was the first patient to be seen on the ward round. This could mean that the perceived learning that was reported may not have been indicative of the interns' learning throughout the entire day. Whether the interns had managed these patients as their first or their twenty-first for the day, there was a strong likelihood that the interns would still have learnt the same things in the same way as their learning reflections indicated. For this reason, this limitation was not considered as prohibitive to maintaining the study's validity.

Lastly, participation rates were always going to be an issue in this study as interns were very busy and working with patients was their first priority. As participation was anonymized, it was impossible to follow up with participants who had not recorded

learning reflections, however regular emails were sent to all participants to encourage them to do so.

7.5 IMPLICATIONS FOR EDUCATIONAL PRACTICE

This study of the current medical internship at TTH has revealed a number of things that could be changed to maximize interns' learning during their internship year.

- The current medical internship is an apprenticeship in the form of a cognitive apprenticeship. Providing supervisors with education about the different phases of a cognitive apprenticeship could make them more cognizant of their role in interns' learning. Assisting interns to understand that intrinsic motivation and being proactive in their approach to learning, is important for clinical supervisors to be able to apply the various phases of the cognitive apprenticeship. Interns could benefit from being equipped with 'internship survival skills' that include effective communication, development of learning objectives, time management skills and skills for receiving feedback.
- Currently supervisors of interns' learning have been identified as time-poor; one effect of this is that there are lost opportunities for interns to learn. There needs to be changes made to the allocation of supervisors' time to assist interns' learning. One solution to this would be for supervisors to be given a portion of 'protected teaching time' each week that was detailed in the facility policies relating to teaching and supervision of junior doctors.
- Formalization of a multidisciplinary teaching structure or a system of interprofessional education where consultants, registrars, junior doctors, nurses and allied health practitioners complement each other's knowledge and skills, could create a stronger clinical teaching environment for the interns.
- Education/re-education of supervisors about the importance of articulating their thinking while they model clinical practice ("thinking out loud") could assist with opportunities for transfer of tacit knowledge such as clinical reasoning and judgment to the interns.
- A better balance of important administrative aspects of care performed by the interns and the range of activities interns undertake, would improve the interns' opportunities to develop their use of clinical reasoning and judgment. This would require minor changes to the current roles and responsibilities of the

interns, i.e. to implement some task shifting (World Health Organization, 2008). Further research is required to determine which aspects of the interns' administrative duties could be transferred to other healthcare workers within the organization.

- Interns' predominant means of learning are by "doing", following a "see one, do one" mantra. These are essentially components of experiential learning and it is important that supervisors facilitate the development of the metacognitive skills interns require to self-manage and work autonomously, that is, to 'Observe', 'Think', 'Plan' and then 'Do' as described in Kolb's experiential learning cycle (1984).
- The ideal learning situation may be for interns to be involved with their patients' entire hospital journeys. This would allow deeper, more holistic learning. However, this would require a system where the interns' workloads are tied to learning rather than to service delivery. In order for this to happen, there would need to be major changes to workforce planning and recruitment; since interns would only manage a fraction of the patients that they currently do, there would need to be more interns/junior doctors recruited to ensure all patients are managed.
- The wide range of clinical settings with different learning experiences allocated to interns provided a broad range of clinical experiences from which they could build their professional craft knowledge. Supervision in each rotation could be better designed to maximize interns' learning. This will not be a 'one-size-fits-all' model of supervision; what this looks like in each rotation/discipline is yet to be determined through further research.
- In a clinical setting, a cognitive apprenticeship helps control the level of risk and complexity of tasks as the interns learn and become more confident and competent with clinical tasks. However, more action-research is required to understand the existing inter-professional culture of various clinical settings and how the teaching of safe patient care occurs.
- A CME points system for interns could easily be supported by organizations and supervisors could easily support interns undertaking CME activities such as audits, quality assurance activities and other research. A CME points system provides flexible learning options, encouraging interns to learn what they feel is important, relevant and/or useful for their current and/or future careers. It provides a framework for interns' learning while encouraging the development of the self-directed learning skills necessary for life-long learning.

7.6 CONCLUSIONS

Learning during a medical internship is multimodal; learning occurred via a cognitive apprenticeship which consists of learning via an 'apprenticeship' relationship with supervisors *and* by self-directed learning. The cognitive apprenticeship requires incremental decreases in the level of supervision with a corresponding increase in clinical responsibilities over time as the intern works towards becoming an independent practitioner. Interaction with supervisors is especially important for interns to learn the aspects of medicine that are difficult, if not impossible to teach. This includes learning the tacit knowledge and skills that enables them to be accepted members of the medical fraternity.

In time-poor learning environments, interns reported taking every advantage of apprenticeship relationships with knowledgeable supervisors; however, because service provision is often prioritized over learning, they supplement this with self-directed learning. Interns must therefore be adaptive learners, able to recognize where and when learning opportunities arise. Interprofessional education should be considered as an organizational strategy to assist interns' learning.

Interns have several tensions they need to negotiate: service provision versus learning; the desire to be independent versus the requirement to be supervised; and the requirement for interns to complete administrative duties rather than having opportunities to experience practical/clinical learning activities. Task shifting should be considered by the organization to free up some of the time interns currently spend on administrative duties and allow them to have more of the hands-on learning opportunities that may assist in further developing their clinical reasoning and judgment.

The learning of medicine is complex. Learning during internship is therefore iterative, rather than a straight forward construction of new knowledge and skills. Interns learn aspects of content, administration and professional identity during their internship year, however the details of what is learnt differs from rotation to rotation. It is therefore important that interns are provided a range of different clinical experiences.

Interns' reported that their motivations to learn were multifactorial and included a desire to be deemed competent and independent practitioners, fear of failure or doing patients harm and working towards getting onto college training programs.

Evidence collected during this study indicates that even though the current medical interns' learning environment is multimodal, it is still dominated by the personal learning relationships interns have with their supervisors (consultants and registrars) and other members of the health care team, from which interns learn content, professional behaviour and clinical reasoning skills. Rather than being "captive to self-directed learning" as stated by Van Der Weyden (2006, p. 313), interns in this study appear to be adaptive learners who are able to use self-directed learning in a positive way to strategically fill the gaps in their educational knowledge and experience. The desire to be recognized as safe, independent practitioners drives interns to learn this way. In learning via cognitive apprenticeships, the interns' use of self-directed learning increases proportionally as the level of supervision is incrementally decreased over time, allowing the interns to move along the continuum of learning towards being independent practitioners.

REFERENCES

Agnew, A., & O'Kane, C. J. (2011). Addressing the hiatus of learning incentives for prevocational doctors: continuing medical education points for interns. *Medical Journal of Australia, 194*(7), 349-352.

Agnew, A., Sen Gupta, T., Quirk, F., Evans, R., & Larkins, S. (2017). The master's apprentice: How do Australian medical interns learn? *Focus on Health Professional Education: A Multi-disciplinary Journal 18*(1), 56-66.

AMC Competency-based Medical Education Working Group. (2010). Competency-based Medical Education AMC Consultation Paper. Retrieved 26 Jan, 2012, from http://www.amc.org.au/index.php/pub/policy-documents

Audetat, M., Dory, V., Nendaz, M., Vanpee, D., Pestiaux, D., Perron, N. J., & Charlin, B. (2012). What is so difficult about managing clinical reasoning difficulties? *Medical Education, 46*, 216-227.

Australian College for Emergency Medicine. (2009). Your Career in Emergency Medicine. Retrieved May, 2010, from http://www.acem.org.au/media/training/YourCareerinEDfinal.pdf

Australian Government Department of Health. (2014). Prevocational General Practice Placements Program. Retrieved 17 Nov, 2018, from http://www.health.gov.au/internet/main/publishing.nsf/Content/work-pr-pgppp

Australian Health Ministers' Advisory Council. (2015a). Review of Medical Intern Training - Discussion Paper. Retrieved Oct, 2015, from http://www.coaghealthcouncil.gov.au/MedicalInternReview/ArtMID/463/ArticleID/49/Discussion-Paper

Australian Health Ministers' Advisory Council. (2015b). Review of Medical Intern Training: Final report. Retrieved Apr, 2016, from http://www.coaghealthcouncil.gov.au/Portals/0/Review%20of%20Medical%20Intern%20Training%20Final%20Report%20publication%20version.pdf

Australian Health Practitioners Regulation Agency. (2015). Interns. Retrieved Apr 2015, from http://www.medicalboard.gov.au/Registration/Interns.aspx

Australian Medical Council. (2011). Assessment and Accreditation of Medical Schools: Standards and Procedures, 2011. Retrieved Jan, 2012, from http://www.medicalboard.gov.au/documents/default.aspx?record=WD10%2F4304&dbid=AP&chksum=s%2FiKOfSxflZW8H%2Bq77JuiQ%3D%3D

Australian Medical Council. (2013). Intern Training - National standards for programs. Retrieved Nov, 2013, from http://www.amc.org.au/files/37fdfb7b6fd3a1acdcc7800c23b42217737c2aa5_original.pdf

Australian Medical Council Limited. (2013). Intern training - Guidelines for terms. Retrieved Feb, 2014, from http://www.amc.org.au/images/Accreditation/Intern_training-Guidelines_for_terms_2013_12_18.pdf

Balmer, D. F., Serwint, J. R., Ruzek, S. B., & Giardino, A. P. (2008). Understanding paediatric resident-continuity preceptor relationships through the lens of apprenticeship learning. *Medical Education, 42*, 923-929.

Bandura, A. (1977). *Social Learning Theory*. New York: General Learning Press.

Bleakley, Alan. (2002). Pre-registration house officers and ward-based learning: a 'new apprenticeship' model. *Medical Education, 36*(1), 9-15.

Bonk, C. J., & Cunningham, D. J. (1998). Chapter 2: Searching for Learner-Centred, Constructivist, and Sociocultural Components of Collaborative Education Learning Tools. In C. J. Bonk & K. S. King (Eds.), *Electronic collaborators: Learner-centred technologies in literacy, apprentiship, and discourse* (pp. 25-50). Mahwah, NJ: Erlbaum.

Boots, R. J., Egerton, W., McKeering, H., & Winter, H. (2009). They just don't get enough! Variable intern experience in bedside procedural skills. *Internal Medicine Journal, 39*(4), 222-227.

Brandt, B. L., Farmer, J. A., & Buckmaster, A. (1993). Cognitive apprenticeship approach to helping adults learn. *New Directions for Adult and Continuing Education, 1993*(59), 69-78.

Brazil, V., & Mitchell, R. (2013). Balancing quantity and quality in emergency medicine training for interns. *Emergency Medicine Australasia, 25*(5), 387-389.

Brooks, K. W. (1979). Delphi technique: Expanding applications. *North Central Association Quarterly, 54*(3), 377-385.

Brown, J., Chapman, T., & Graham, D. (2007). Becoming a new doctor: A learning or survival exercise? *Medical Education, 41*(7), 653-660.

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*, 245-281.

Caldwell, G. (2011). Whatever happened to apprenticeship learning? *The Clinical Teacher, 8*, 272-275.

Candy, P. C. (1991). *Self-direction for lifelong learning: A comprehensive guide to theory and practice*. San Francisco: Jossey-Bass.

Carley, S., Beardsell, I., May, N., Crowe, L., Baombe, J., Grayson, A., . . . Body, R. (2018). Social-media-enabled learning in emergency medicine: a case study of growth, engagement and impact of a free open access medical education blog. *Postgraduate Medical Journal, 94*(1108), 92-96.

Chen, J. J. J., Ngo, V., Chew, C. M., Teo, M. K. Y., & Zellweger, R. (2017). What does an intern doctor actually do? A quantification of time on work activities. *Australasian Medical Journal, 10*(12), 1008-1013.

Chu, W., & Hsu, L. (2011). The Process of Acquiring Practical Knowledge by Emergency Nursing Professionals in Taiwan: A Phenomenological Study. *Journal of Emergency Nursing, 37*(2), 126-131.

Chung, E., & Sprott, P. (2008). Interns' assessment and management of three common urological conditions: a survey of their knowledge and skills. Are they adequately prepared for clinical practice? *New Zealand Medical Journal, 121*(1273), 45-50.

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: teaching the crafts of reading, writing, and mathematics. In L. B. Resnick (Ed.), *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser* (pp. 453–494). Hillsdale, N. J.: Lawrence Erlbaum Associates.

Committee on Planning a Continuing Health Care Professional Education Institute. (2009). *Redesigning Continuing Education in the Health Professionals*. Washington, DC: The National Academy Press.

Commonwealth Department of Health and Ageing. (2003). National Training and Assessment Guidelines for Junior Medical Doctors PGY 1 and 2. Retrieved Jan, 2012, from http://www.pmcq.com.au/images/pdfs/accreditation/articles/Nat%20Training%20&%20Assess%20Guidelines%20JMO%20PGY1%202.pdf

Confederation of Postgraduate Medical Education Councils. (2003). National Training and Assessment Guidelines for Junior Medical Doctors PGY 1 and 2. Retrieved Nov, 2016, from http://www.cpmec.org.au/files/National-Assess-Guidelines.pdf

Confederation of Postgraduate Medical Education Councils. (2008). Australian Curriculum Framework for Junior Doctors. Retrieved Jan, 2012, from http://curriculum.cpmec.org.au/

Confederation of Postgraduate Medical Education Councils. (2012). Response to the Proposed National Safety and Quality Framework. Retrieved Nov, 2016, from https://www.safetyandquality.gov.au/wp-content/uploads/2012/03/29199-66.pdf

Coombes, I. D., Stowasser, D. A., Coombes, J. A., & Mitchell, C. (2008). Why do interns make prescribing errors? A qualitative study. *Medical Journal of Australia, 188*(2), 89-94.

Creswell, J. W. (2009). *Research Design: Qualitative, quantitative and mixed methods approaches* (3rd ed.). Thousand Oaks, California: SAGE Publications, Inc.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62*, 119-142.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A Meta-analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation. *Psychological Bulletin, 125*(6), 627-688.

Dent, A. W., Crotty, B., Cuddihy, H. L., Duns, G. C., Benjamin, J, Jordon, C. A., . . . Jolly, B. C. (2006). Learning opportunities for Australian prevocational hospital doctors: exposure, perceived quality and desired methods of learning. *Medical Journal of Australia, 184*(9), 436-440.

Dent, A. W., Weiland, T. J., & Paltridge, D. (2008). Australasian emergency physicians: a learning and educational needs analysis. Part five: barriers to CPD experienced by FACEM, and attitudes to the ACEM MOPS programme. *Emergency Medicine Australasia 20*(4), 339-346.

Derrick, S., Badger, B., Chandler, J., Nokes, T., & Winch, G. (2006). The training/service continuum: exploring the training/service balance of senior house officer activities. *Medical Education, 40*(4), 355-362.

Derry, S. J. (1996). Cognitive schema theory in the constructivist debate. *Educational Psychologist, 31*(3), 163-174.

Eley, D. S., Young, L., Wilkinson, D., Chater, A. B., & Baker, P. G. (2008). Coping with increasing numbers of medical students in rural clinical schools: options and opportunities. *Medical Journal of Australia, 188*(11), 669-671.

Eraut, M. (1994). *Developing Professional Knowledge and Competence*. Oxon: Routledge.

Eraut, M. (2004). Informal Learning in the Workplace. *Studies in Continuing Education, 26*(2), 247-273.

Farmer, J. A., Buckmaster, A., & LeGrand, B. (1992). Cognitive apprenticeship: Implications for continuing professional education. *New Directions for Adult and Continuing Education, 1992*(55), 41-49.

Fletcher, K. E., Visotcky, A. M., Slagle, J. M., Tarima, S., Weinger, M. B., & Schapira, M. M. (2012). The composition of intern work while on call. *Journal of General Internal Medicine, 27*(11), 1432-1437.

Gable, R. K., & Wolf, M. B. (1993). *Instrument development in the affective domain: Measuing attitudes and values in corporate and school settings* (2nd ed.). Boston: Kluver Academic Publishers.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly, 48*(1), 18-33.

Geffen, L. (2014). A brief history of medical education and training in Australia. *Medical Journal of Australia, 201*(1), S19-22.

Gillard, J. H., Dent, T. H. S., Smyth-Pigott, P. J., & Eaton, J. (2000). Recent changes in the workload and clinical experience of pre-registration house officers: Experiences over four years in south-west England. *Medical Education, 34*(5), 371-373.

Goodyear-Smith, F., Whitehorn, M., & McCormick, R. (2003). General practitioners' perceptions of continuing medical education's role in changing behaviour. *Education for Health 16*(3), 328-338.

Green, J., & Thorogood, N. (2009). *Qualitative Methods for Health Research* (2nd ed.). London: SAGE Publications, Inc.

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a Conceptual Framework for Mixed-Methods Evaluation Designs. *Educational Evaluation and Policy Analysis, 11*(3), 255-274.

Guglielmino, L. M. (1978). *Development of the self-directed learning readiness scale* (Doctoral dissertation), University of Georgia, Abstracts International. (38, 6467A)

Guglielmino, L. M., & Guglielmino, P. J. (2007). What is the Self-Directed Learning Readiness Scale? Retrieved Jan, 2012, from http://www.lpasdlrs.com/

Guraya, S. Y., & Barr, H. (2018). The effectiveness of interprofessional education in healthcare: A systematic review and meta-analysis. *Kaohsiung Journal of Medical Sciences, 34*, 160-165.

Higgins, R., Cavendish, S., & Gregory, R. (2006). Class half-empty? Pre-registration house officer attendance at weekly teaching sessions: Implications for delivering the new Foundation Programme curriculum. *Medical Education, 40*(9), 877-883. doi: 10.1111/j.1365-2929.2006.02549.x

Higgs, J., & Andresen, L. (2001). The knower, the knowing and the known: threads in the woven tapestry of knowledge. In J. Higgs & A. Titchen (Eds.), *Practice Knowledge and Expertise in the Health Professions* (pp. 10-21). Oxford: Butterworth-Heineman.

Houle, C. O. (1988). *The inquiring mind* (2nd ed.). Madison: University of Winsconsin Press.

Iedema, R., Brownhill, S., Haines, M., Lancashire, B., Shaw, T., & Street, J. (2010). 'Hands on, Hands off': a model of clinical supervision that recognises trainees' need for support and independence. *Australian Health Review, 34*(3), 286-291.

Isoardi, J., Spencer, L., Sinnott, M., & Eley, R. (2015). Impact of formal teaching on medical documentation by interns in an emergency department in a Queensland teaching hospital. *Emergency Medicine Australasia, 27*(1), 6-10.

Isoardi, J., Spencer, L., Sinnott, M., Nicholls, K., O'Connor, A., & Jones, F. (2013). Exploration of the perceptions of emergency physicians and interns regarding the medical documentation practices of interns. *Emergency Medicine Australasia, 25*, 302-307.

Johnson, B., & Turner, L. A. (2003). Chapter 11 - Data collection strategies in mixed methods research. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of Mixed Methods in Social & Behavioral Research*. Thousand Oaks, CA: SAGE Publications, Inc.

Joyce, C., Stoelwinder, J. U., McNeil, J. J., & Piterman, L. (2007). Riding the wave: current and emerging trends in graduates from Australian university medical schools. *Medical Journal of Australia 186*(6), 309-312.

Kilminster, S., Zukas, M., Quinton, N., & Roberts, T. (2011). Preparedness is not enough: understanding transitions as critically intensive learning periods. *Medical Education, 45*, 1006-1015.

Kiser, Kim. (2011). 25 ways to use your smartphone. Physicians share their favorite uses and apps. *Minnesota Medicine, 94*(4), 22-29.

Knowles, M.S. (1970). *The modern practice of adult education: Andragogy verses pedagogy*. New York: Cambridge Books.

Knowles, M.S. (1980). *The modern practice of adult education: from pedagogy to andragogy*: Association Press.

Knowles, M.S., Holton, E.F., & Swanson, R.A. (1998). *The Adult Learner: The definitive classic in adult education and human resource development* (Fifth ed.). Woburn: Butterworth-Heinemann.

Kolb, D. A. (1984). *Experiential Learning: Experience as a Source of Learning and Development*. Englewood Cliffs, New Jersey: Prentice Hall.

Laskaratos, F. M., Wallace, D., Gkotsi, D., Burns, A., & Epstein, O. (2015). The educational value of ward rounds for junior trainees. *Medical Education Online, 20*(1).

Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.

Lemmp, H., Cochrane, M., & Rees, J. (2005). A qualitative study of the perceptions and experiences of Pre-Registration House Officers on teamwork and support. *BMC Medical Education, 5:10*.

Liamputtong, P. (Ed.). (2010). *Research methods in health: foundation for evidence-based practice*. Melbourne, Australia: Oxford University Press.

Mak, D. B., & Plant, A. J. (2005). Reducing unmet needs: a prevocational medical training program in public health medicine and primary health care in remote Australia. *Australian Journal of Rural Health, 13*(3), 183-190.

Medical Board of Australia. (2011). Provisional Registration. Retrieved Dec, 2011, from http://www.medicalboard.gov.au/Registration/Types/Provisional-Registration.aspx

Members of the Medical Professionalism Project. (2002). Medical professionalism in the new millennium: a physicians' charter. *Medical Journal of Australia, 177*(5), 263-265.

Mitchell, R., Regan-Smith, M., Fisher, M. A., Knox, I., & Lambert, D. R. (2009). A new measure of the cognitive, metacognitive, and experiential aspects of residents' learning. *Academic Medicine, 84*(7), 918-926.

Monaghan, S. F., Blakely, A. M., Richardson, P. J., Miner, T. J., Cioffi, W. G., & Harrington, D. T. (2012). The reflective statement: A new tool to assess resident learning. *Journal of Surgical Research, 178*(2), 618-622.

Morse, J. M. (1991). Approaches to Qualitative-Quantitative Methodological Triangulation. *Nursing Research, 40*(2), 120-123.

Moustakas, C. (1994). *Phenomenological Research Methods*. Thousand Oaks, CA: SAGE Publications, Inc.

Nevin, C. R., Cherrington, A., Roy, B., Daly, D. D., Rodriguez, J. M., Patel, M., . . . Willig, J. H. (2014). A qualitative assessment of internal medicine resident perceptions of graduate medical education following implementation of the 2011 ACGME duty hour standards. *BMC Medical Education, 14*(1).

Nielsen, K. (2010). Apprenticeship Approach to Learning. In P. Peterson, E. Baker & B. McGaw (Eds.), *International Encyclopedia of Education (Third Edition)* (pp. 469-475): Elsevier Ltd.

Ormrod, J. E. (1999). *Human Learning* (3rd ed.). Englewood Cliffs, NJ: Merrill.

Oxford Dictionaries Online Team. (2012). Oxford Dictionaries. Retrieved 11 March, 2012, from http://oxforddictionaries.com/definition/apprentice

Paltridge, D. (2006). Prevocational medical training in Australia: Where does it need to go? *Medical Journal of Australia, 184*(7), 349-352.

Paris, S. G., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist, 36*(2), 89-101.

Peck, C., McCall, M., McLaren, B., & Rotem, T. (2000). Continuing medical education and continuing professional development: international comparisons. *British Medical Journal, 320*, 432-435.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of Self-Regulation: Theory, research and applications* (pp. 452-502). San Diego, CA: Academic.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review, 16*, 385-407.

Polanyi, M. (1958). *Personal Knowledge: Towards a Post-Critical Philosophy*. Chicago: University of Chicago Press.

Polanyi, M. (1966). *The Tacit Dimension*. Chicago: University of Chicago Press.

Reeves, S., Perrier, L., Goldman, J., Freeth, D., & Zwarenstein, M. (2013). Interprofessional education: effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*(3).

Reines, H. D., Robinson, L., Nitzchke, S., & Rizzo, A. (2007). Defining service and education: the first step to developing the correct balance. *Surgery, 142*(2), 303-310.

Rogers, C. R. (1969). *Freedom to Learn*. Columbus, OH: Merrill.

Royal Australasian College of Surgeons. (2010). MOPS: Maintenance of Professional Standards Program. Retrieved Jan, 2012, from http://www.racs.edu.au/media/447214/mnl_2010_mops_2010-2012_information_manual.pdf

Royal Australasian College of Surgeons. (2011). Becoming a Surgeon. Retrieved Dec, 2011, from http://www.surgeons.org/racs/education--trainees/becoming-a-surgeon

Rudland, J., Bagg, W., Child, S., De Beer, W., Hazell, W., Poole, P., . . . Wilkinson, T. J. (2010). Maximising learning through effective supervision. *New Zealand Medical Journal, 123*(1309), 117-126.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67.

Ryan, R. M., Mims, V., & Koestner, R. (1983). Relation of reward contingency and interpersonal context to intrinsic motivation: A review and test using cognitive evaluation theory. *Journal of Personality and Social Psychology, 45*, 736-750.

Saldana, J. (2013). *The Coding Manual for Qualitative Researchers* (2nd ed.). London: SAGE Publications Ltd.

Sanders, J. (2013). When I say … self-regulated learning. *Medical Education, 47*(12), 1162-1163.

Schon, D. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.

Seltz, L. B., Preloger, E., Hanson, J. L., & Lane, L. (2016). Ward Rounds With or Without an Attending Physician: How Interns Learn Most Successfully. *Academic Pediatrics, 16*(7), 638-644.

Sen Gupta, T. K., Murray, R. B., McDonell, A., Murphy, B., & Underhill, A. D. (2008). Rural internships for final year students: clinical experience, education and workforce. *Rural Remote Health 8*(1), 827.

Sheehan, D., Bagg, W., De Beer, W., Child, S., Hazell, W., Rudland, J., & Wilkinson, T. J. (2010). The good apprentice in medical education. *New Zealand Medical Journal, 123*(1308), 89-96.

Sheehan, D., Wilkinson, T. J., & Bowie, E. (2012). Becoming a practitioner: Workplace learning during the junior doctor's first year. *Medical Teacher, 34*, 936-945.

Singh, G., Harvey, R., Dyne, A., Said, A., & Scott, I. (2015). Hospital discharge summary scorecard: A quality improvement tool used in a tertiary hospital general medicine service. *Internal Medicine Journal, 45*(12), 1302-1305.

Skinner, B. F. (1958). Teaching Machines. *Science, 128*(3330), 969-977.

Smits, P. B., Verbeek, J. H., Nauta, M. C., Ten Cate, T. J., Metz, J. C., & van Dijk, F. J. (2004). Factors predictive of successful learning in postgraduate medical education. *Medical Education, 38*(7), 758-766.

Spencer, J. A., & Jordan, R. K. (1999). Learner centred approaches in medical education. *British Medical Journal, 318*, 1280-1283.

Stalmeijer, R. E. (2015). When I say ... cognitive apprenticeship. *Medical Education, 49*, 355-356.

Stalmeijer, R. E., Dolmans, D. H. J. M., Snellen-Balendong, H. A. M., van Santen-Hoeufft, M., Wolfhagen, I. H. A. P., & Scherpbier, A. J. J. A. (2013). Clinical teaching based on principles of cognitive apprenticeship: views of experienced clinical teachers. *Academic Medicine 88*(6), 861-865.

Stangroom, J. (2016). Social Science Statistics: Z score calculator for 2 population proportions. Retrieved Nov, 2016, from http://www.socscistatistics.com/tests/ztest/Default2.aspx

Sterkenburg, A., Barach, P., Kalkman, C., Gielen, M., & ten Cate, O. (2010). When do Supervising Physicians Decide to Entrust Resdients with Unsupervised Tasks? *Academic Medicine, 85*, 1408-1417.

Tan, B., Mulo, B., & Skinner, M. (2015). Discharge documentation improvement project: A pilot study. *Internal Medicine Journal, 45*(12), 1280-1285.

Tashakkori, A., & Creswell, J. (2007). The new era of mixed methods. *Journal of Mixed Methods Research, 1*, 3-7.

Teunissen, P. W., Boor, K., Scherpbier, A. J., van der Vleuten, C. P., van Diemen-Steenvoorde, J. A., van Luijk, S. J., & Scheele, F. (2007). Attending doctors' perspectives on how residents learn. *Medical Education, 41*(11), 1050-1058.

Teunissen, P. W., Scheele, F., Scherpbier, A. J., van der Vleuten, C. P., Boor, K., van Luijk, S. J., & van Diemen-Steenvoorde, J. A. (2007). How residents

learn: qualitative evidence for the pivotal role of clinical activities. *Medical Education, 41*(8), 763-770.

The Doc Tools. (2006). Macro - Extract Comments to New Document. Retrieved Aug, 2012, from http://www.thedoctools.com/index.php?show=mt_comments_extract

The Royal Australian College of Physicians. (2009). Training Pathways. Retrieved Dec, 2011, from http://www.racp.edu.au/page/educational-and-professional-development/training-pathways

Thompson, D. (Ed.). (1995). *The Concise Oxford Dictionary of Current English* (Ninth ed.). New York: Oxford University Press.

Tough, A. (1967). *Learning without a teacher*. Toronto: Ontario Institute for Studies in Education.

Tough, A. (1971). *The adult's learning projects: A fresh approach to theory and practice in adult learning*. Toronto: Ontario Institute for Studies in Education.

Trumble, S. C. (2011). The evolution of general practice training in Australia. *Medical Journal of Australia, 194*(11), S59-62.

Vallis, J., Hesketh, A., & Macpherson, S. (2004). Pre-registration house officer training: A role for nurses in the new Foundation Programme? *Medical Education, 38*(7), 708-716.

Van Der Weyden, M. B. (2006). From the Editor's Desk - Sustaining Apprenticeships. *Medical Journal of Australia, 184*(7), 313.

Wadsworth, B. J. (1971). *Piaget's theory of cognitive development*. New York: Longman Inc.

Westbrook, J. I., Ampt, A., Kearney, L., & Rob, M. I. (2008). All in a day's work: an observational study to quantify how and with whom doctors on hospital wards spend their time. *Medical Journal of Australia, 188*(9), 506-509.

Wilkinson, T. J., & Sheehan, D. (2011). *Becoming a Practitioner*. Paper presented at the "Bridging the Gap" - 16th Prevocational Medical Education Forum, Auckland, NZ.

Williams, K. N., Ramani, S., Fraser, B., & Orlander, J. D. (2008). Improving bedside teaching: findings from a focus group study of learners. *Academic Medicine, 83*(3), 257-264.

Winne, P. H., & Perry, N. E. (2000). Measuring self-regulated learning. In P. Pintrich, M. Boekarts & M. Zeidner (Eds.), *Handbook of Self-Regulation: Theory, research and applications* (pp. 531-566). San Diego, CA: Academic.

World Federation for Medical Education. (2003). Continuing Professional Development (CPD) of Medical Doctors - WFME Global Standards for Quality Improvement. Retrieved Jan, 2012, from http://www.who.int/workforcealliance/knowledge/toolkit/46.pdf

World Health Organization. (2008). First Global Conference on Task Shifting. Retrieved 17 Feb, 2019, from https://www.who.int/healthsystems/task_shifting/en/

Zhu, J. N., Weiland, T. J., Taylor, D. M., & Dent, A. W. (2008). An observational study of emergency department intern activities. *Medical Journal of Australia 188*(9), 514-519.

Zimmerman, B. J. (2001). Theories of self-regulated learning and academic achievement: an overview and analysis. In B. J. Zimmerman & D. H. Schunk (Eds.), *Self-regulated Learning and Academic Achievement: Theoretical Perspectives* (2nd ed., pp. 1-37). London: Lawrence Erlbaum.

APPENDICES

First case of the day – Step 1

Identifier: …….. **Rotation: ……..**

Date: …….. **Case: ……...**

What I learnt:

CONTENT	ADMINISTRATION	PROFESSIONAL IDENTITY
❑ Patient history	❑ How to write up patient charts/notes	❑ What to say to sound professional
❑ How to examine patient	❑ What to write in patient notes	❑ What to do to look professional
❑ Check diagnosis	❑ How to access patient charts / patient details	❑ How to say or do something so I look professional
❑ Condition details/theory	❑ How to use Computer package	❑ How to delegate??
❑ Clinical knowledge	❑ How to access X-rays	❑ How to not get too emotionally involved
❑ New non-invasive procedure	❑ How to access pathology results	❑ How to ask for help
❑ New invasive procedure	❑ How to access imaging results	❑ When to ask for help
❑ How to prescribe	❑ How to admit patients	❑ How to motivate myself
❑ Correct medication to prescribe	❑ How to find a bed for a patient	❑ How to work more efficiently
❑ Medication dosage	❑ Where to find forms / paperwork	❑ Who to trust/ not to trust
❑ How to order investigations	❑ How to write certificates	❑ Who to talk to / not to talk to
❑ What investigations to order	❑ How to refer patients	❑ How to reason out differentials
❑ How to interpret investigation results	❑ How to write referrals	❑ How to work in a team
❑ New procedural skill	❑ How to discharge patient	❑ How to self-evaluate
❑ How to reason out differentials	❑ How to organize support for patient	❑ How /when to learn from my mistakes
❑ How to present patient	❑ How to transfer patient	❑ What is ethical / not ethical
❑ How to consent patient	❑ How to contact GPs	❑ How to lead better / be a better leader
❑ New clinical knowledge – informal learning opportunity	❑ How to contact Supervisors (Consultant/ Registrar)	❑ How to take responsibility
❑ New clinical knowledge – formal learning opportunity	❑ Who are the appropriate people to contact	❑ When to take responsibility
❑ How to assess risk	❑ How to contact other appropriate people (other than GP & Other health professionals)	❑ How to foster relationships
❑ How to research	❑ How to communicate with other health professionals	❑ Which relationships to foster
❑ How to use relevant theory	❑ How to write discharge summary	❑ How to improve my practice
❑ How to problem solve a situation	❑ What to write in discharge summary	❑ When to improve my practice
❑ How to prioritize	❑ How to consent patient??	❑ My limitations
❑ When to prioritize	❑ How to time manage better	❑ My Scope of Practice
❑ What to prioritize	❑ How to prioritize	❑ How to prioritize
	❑ When to prioritize	❑ When to prioritize
	❑ What to prioritize	❑ What to prioritize
	❑ How to keep up to date with information	
	❑ How to organize information for handover	

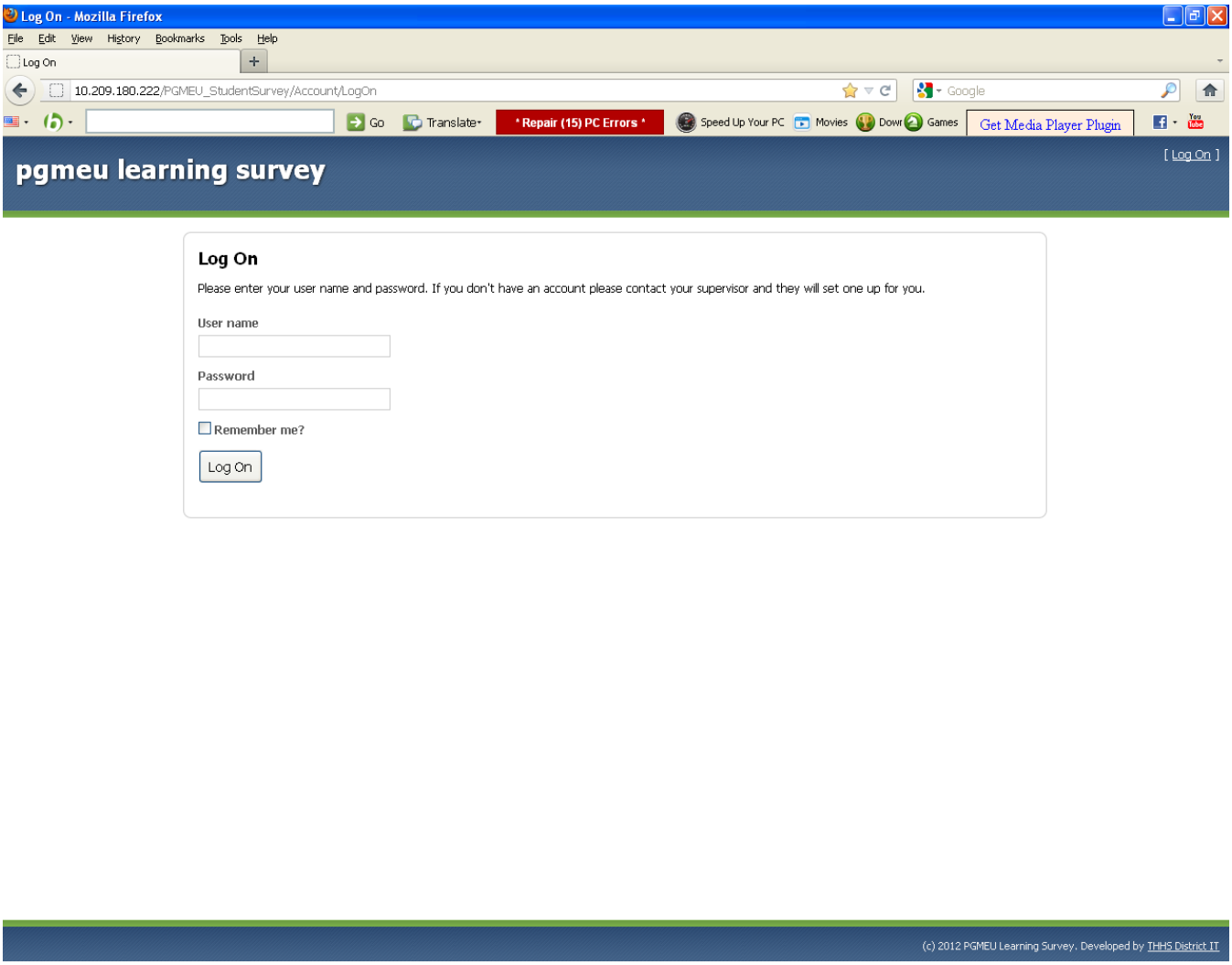
First case of the day – Step 2

Identifier: …… Rotation: ……

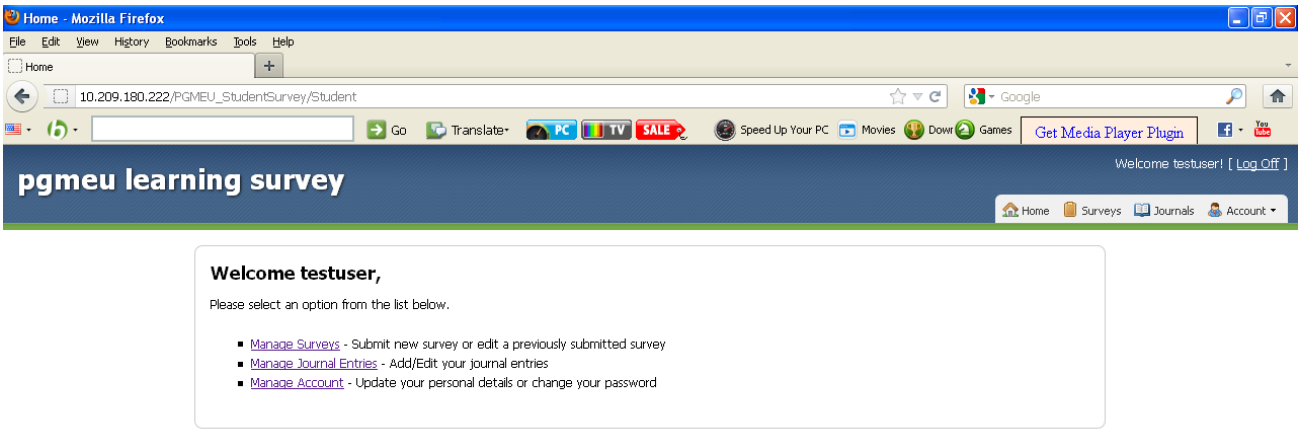
Date: ……. Case: ……..

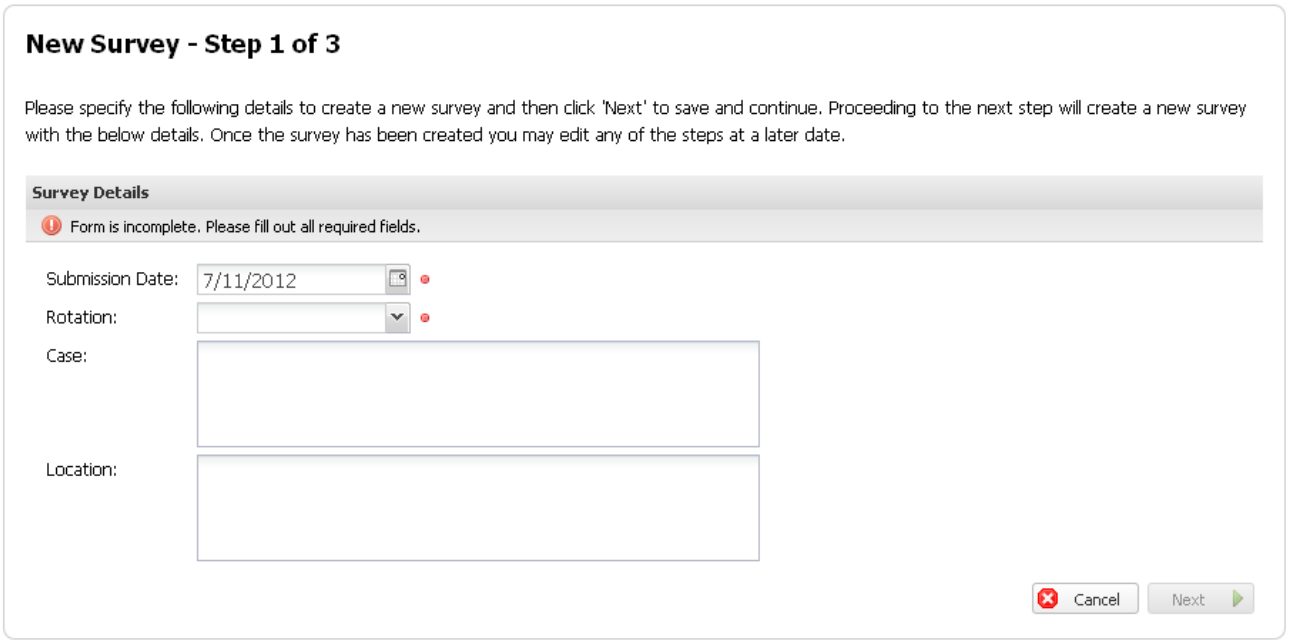
What I learnt:	**What I learnt:**	**What I learnt:**
Where I was when this occurred:	**Where I was when this occurred:**	**Where I was when this occurred:**
Where I learnt it from and how: (Please indicate contributions of those selected) **Consultant** …… Watching them …… Listening to them …… Telling me …… Feedback from them …… Demonstration …… Assisted me …… Other **Registrar** …… Watching them …… Listening to them …… Telling me …… Feedback from them …… Demonstration …… Assisted me …… Other **Nurses** …… Telling me …… Suggested to me …… Showing me …… Other **Allied Health Practitioner** …… Telling me …… Suggested to me …… Showing me …… Other **Patients and/or Patient's Family** …… Patient's notes / charts …… Telling me directly …… Listening to them …… Answer to my question **Previous knowledge** …… Personal experience …… Uni knowledge …… Lecture …… Tutorial …… Hospital education session **Peers (Doctors)** …… Handover …… Listening to them …… Watching them …… Answer to my questions **Other resources** …… Books …… CKN - Therapeutic Guidelines …… CKN - MIMS …… UpToDate …… 'Dr Google' …… Guidelines (e.g. RCH / RBCH) …… Policy …… Formal education session …… Images …… Video …… Online tutorial …… PowerPoint	**Where I learnt it from and how:** (Please indicate contributions of those selected) **Consultant** …… Watching them …… Listening to them …… Telling me …… Feedback from them …… Demonstration …… Assisted me …… Other **Registrar** …… Watching them …… Listening to them …… Telling me …… Feedback from them …… Demonstration …… Assisted me …… Other **Nurses** …… Telling me …… Suggested to me …… Showing me …… Other **Allied Health Practitioner** …… Telling me …… Suggested to me …… Showing me …… Other **Patients and/or Patient's Family** …… Patient's notes / charts …… Telling me directly …… Listening to them …… Answer to my question **Previous knowledge** …… Personal experience …… Uni knowledge …… Lecture …… Tutorial …… Hospital education session **Peers (Doctors)** …… Handover …… Listening to them …… Watching them …… Answer to my questions **Other resources** …… Books …… CKN - Therapeutic Guidelines …… CKN - MIMS …… UpToDate …… 'Dr Google' …… Guidelines (e.g. RCH / RBCH) …… Policy …… Formal education session …… Images …… Video …… Online tutorial …… PowerPoint	**Where I learnt it from and how:** (Please indicate contributions of those selected) **Consultant** …… Watching them …… Listening to them …… Telling me …… Feedback from them …… Demonstration …… Assisted me …… Other **Registrar** …… Watching them …… Listening to them …… Telling me …… Feedback from them …… Demonstration …… Assisted me …… Other **Nurses** …… Telling me …… Suggested to me …… Showing me …… Other **Allied Health Practitioner** …… Telling me …… Suggested to me …… Showing me …… Other **Patients and/or Patient's Family** …… Patient's notes / charts …… Telling me directly …… Listening to them …… Answer to my question **Previous knowledge** …… Personal experience …… Uni knowledge …… Lecture …… Tutorial …… Hospital education session **Peers (Doctors)** …… Handover …… Listening to them …… Watching them …… Answer to my questions **Other resources** …… Books …… CKN - Therapeutic Guidelines …… CKN - MIMS …… UpToDate …… 'Dr Google' …… Guidelines (e.g. RCH / RBCH) …… Policy …… Formal education session …… Images …… Video …… Online tutorial …… PowerPoint

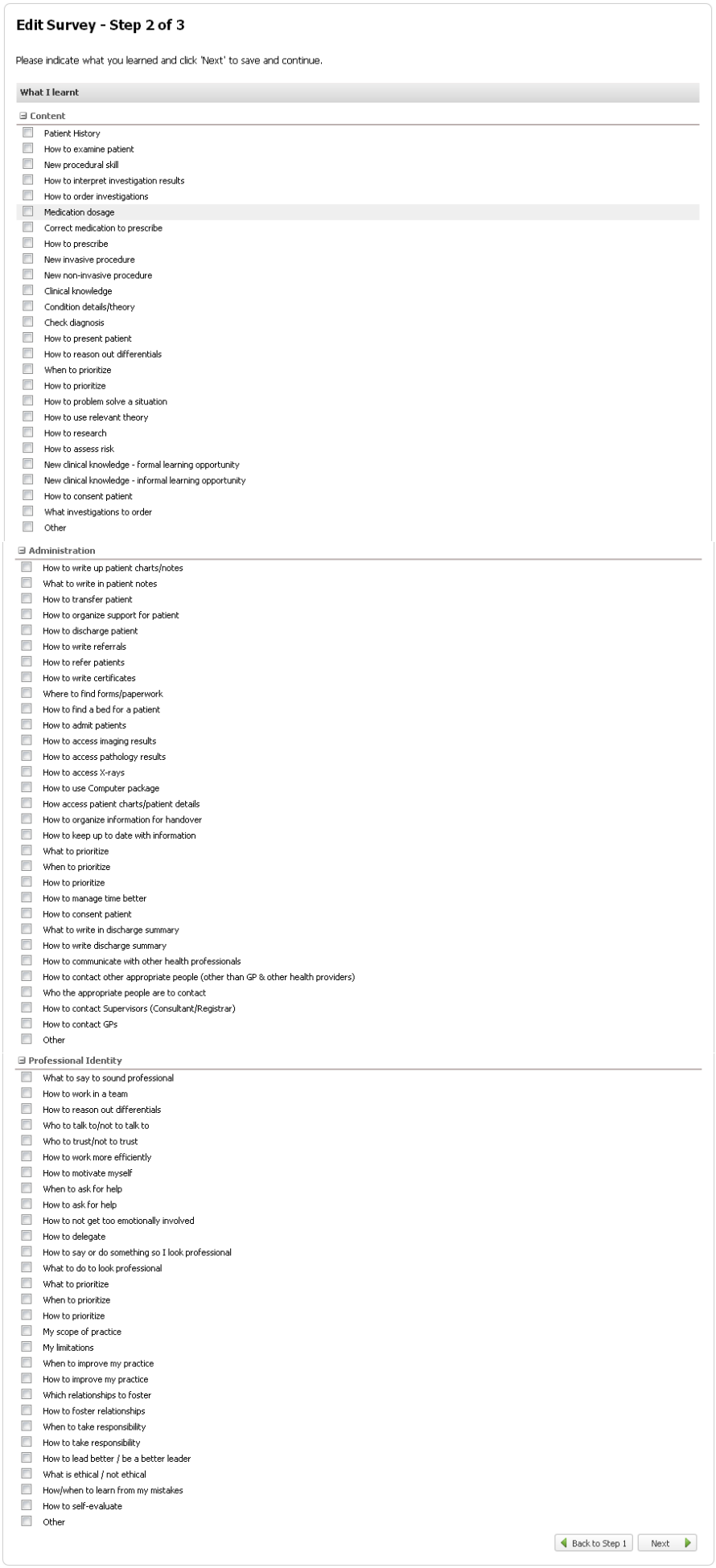
APPENDIX 3 – ONLINE 'APP' – LOG ON



APPENDIX 4 – ONLINE 'APP' – MENU




New Survey - Step 1 of 3
Please specify the following details to create a new survey and then click 'Next' to save and continue. Proceeding to the next step will create a new survey with the below details. Once the survey has been created you may edit any of the steps at a later date.
Survey Details
Form is incomplete. Please fill out all required fields.
Submission Date:
7/11/2012
Rotation:
Case:
Location:
Cancel
Next



Edit Survey - Step 2 of 3

Please indicate what you learned and click 'Next' to save and continue.

What I learnt

Content

- Patient History
- How to examine patient
- New procedural skill
- How to interpret investigation results
- How to order investigations
- Medication dosage
- Correct medication to prescribe
- How to prescribe
- New invasive procedure
- New non-invasive procedure
- Clinical knowledge
- Condition details/theory
- Check diagnosis
- How to present patient
- How to reason out differentials
- When to prioritize
- How to prioritize
- How to problem solve a situation
- How to use relevant theory
- How to research
- How to assess risk
- New clinical knowledge - formal learning opportunity
- New clinical knowledge - informal learning opportunity
- How to consent patient
- What investigations to order
- Other

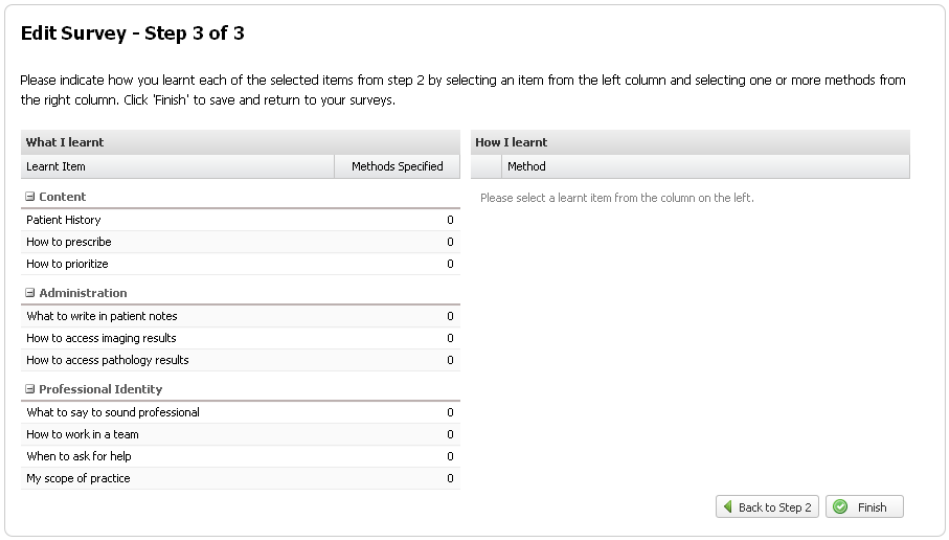
Administration

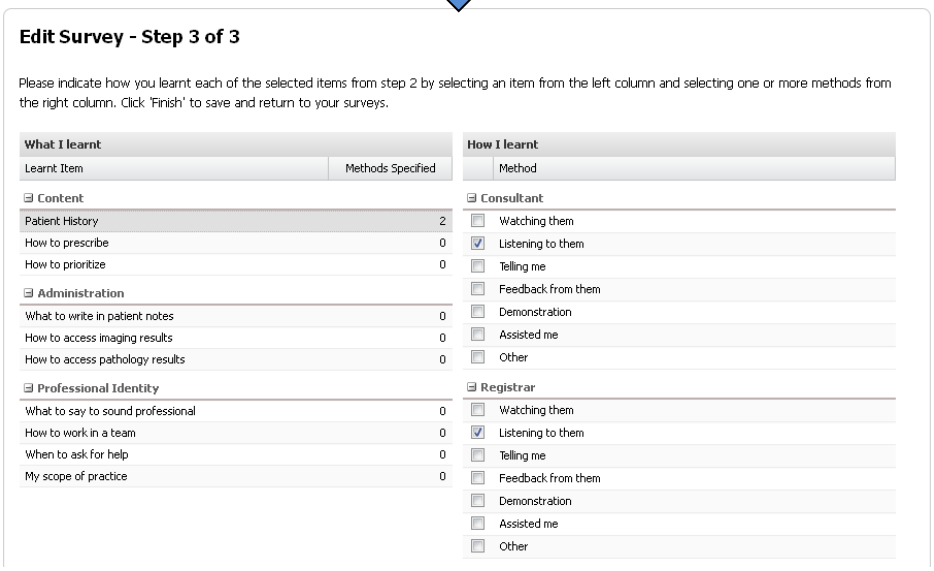
- How to write up patient charts/notes
- What to write in patient notes
- How to transfer patient
- How to organize support for patient
- How to discharge patient
- How to write referrals
- How to refer patients
- How to write certificates
- Where to find forms/paperwork
- How to find a bed for a patient
- How to admit patients
- How to access imaging results
- How to access pathology results
- How to access X-rays
- How to use Computer package
- How access patient charts/patient details
- How to organize information for handover
- How to keep up to date with information
- What to prioritize
- When to prioritize
- How to prioritize
- How to manage time better
- How to consent patient
- What to write in discharge summary
- How to write discharge summary
- How to communicate with other health professionals
- How to contact other appropriate people (other than GP & other health providers)
- Who the appropriate people are to contact
- How to contact Supervisors (Consultant/Registrar)
- How to contact GPs
- Other

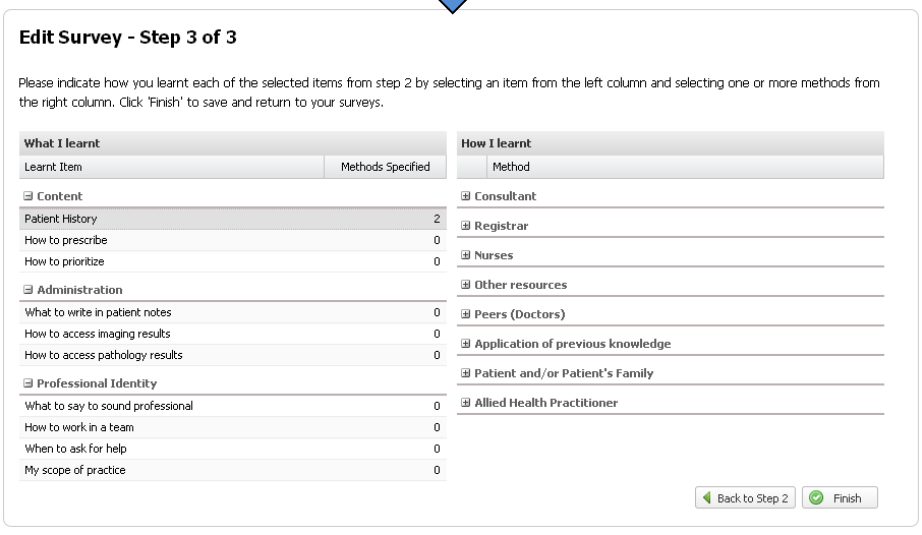
Professional Identity

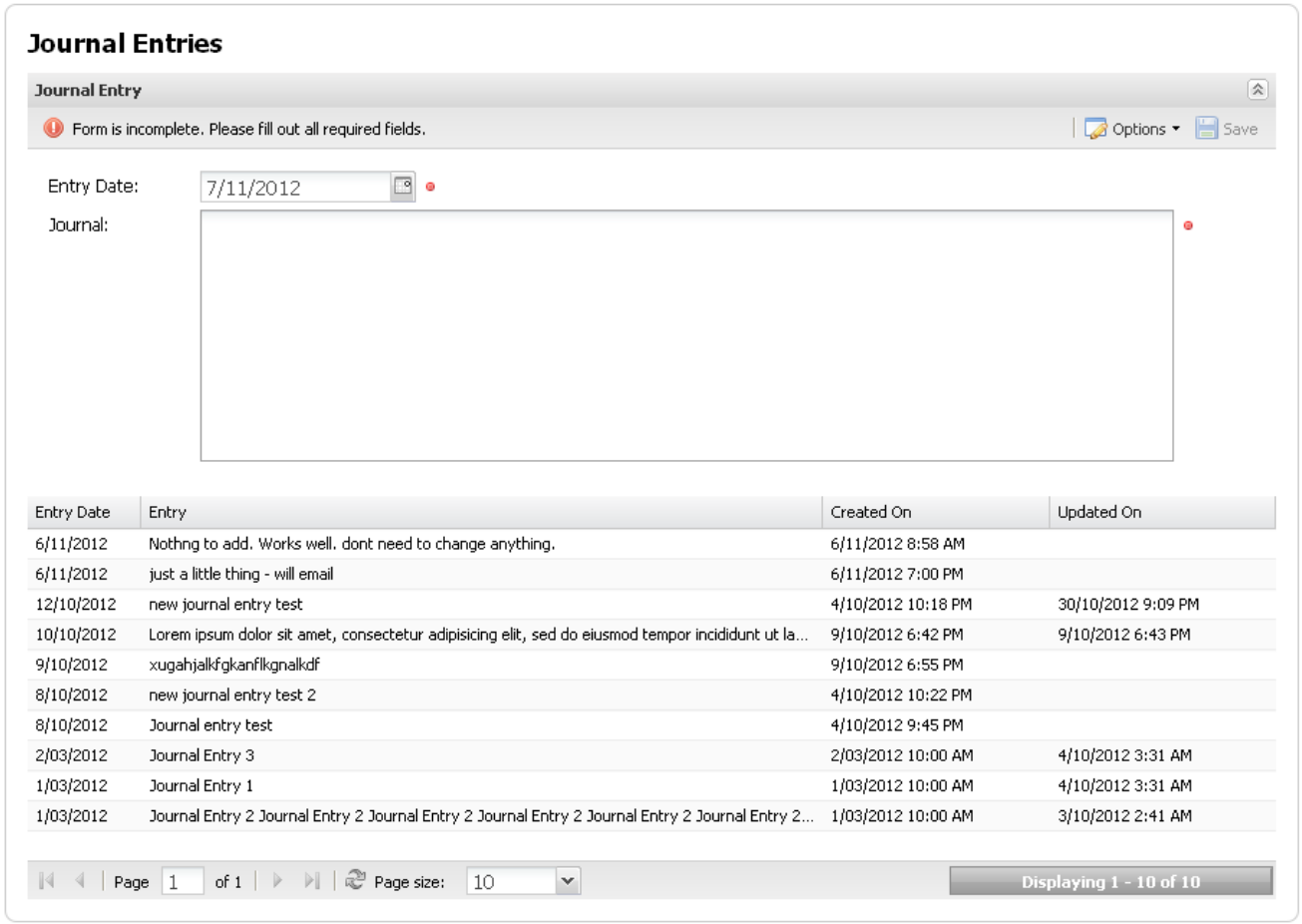
- What to say to sound professional
- How to work in a team
- How to reason out differentials
- Who to talk to/not to talk to
- Who to trust/not to trust
- How to work more efficiently
- How to motivate myself
- When to ask for help
- How to ask for help
- How to not get too emotionally involved
- How to delegate
- How to say or do something so I look professional
- What to do to look professional
- What to prioritize
- When to prioritize
- How to prioritize
- My scope of practice
- My limitations
- When to improve my practice
- How to improve my practice
- Which relationships to foster
- How to foster relationships
- When to take responsibility
- How to take responsibility
- How to lead better / be a better leader
- What is ethical / not ethical
- How/when to learn from my mistakes
- How to self-evaluate
- Other

Back to Step 1 | Next


Edit Survey - Step 3 of 3
Please indicate how you learnt each of the selected items from step 2 by selecting an item from the left column and selecting one or more methods from the right column. Click 'Finish' to save and return to your surveys.
What I learnt
Learnt Item
Methods Specified
Content
Patient History 0
How to prescribe 0
How to prioritize 0
Administration
What to write in patient notes 0
How to access imaging results 0
How to access pathology results 0
Professional Identity
What to say to sound professional 0
How to work in a team 0
When to ask for help 0
My scope of practice 0
How I learnt
Method
Please select a learnt item from the column on the left.
Back to Step 2
Finish


Edit Survey - Step 3 of 3
Please indicate how you learnt each of the selected items from step 2 by selecting an item from the left column and selecting one or more methods from the right column. Click 'Finish' to save and return to your surveys.
What I learnt
Learnt Item
Methods Specified
Content
Patient History 2
How to prescribe 0
How to prioritize 0
Administration
What to write in patient notes 0
How to access imaging results 0
How to access pathology results 0
Professional Identity
What to say to sound professional 0
How to work in a team 0
When to ask for help 0
My scope of practice 0
How I learnt
Method
Consultant
Watching them
Listening to them
Telling me
Feedback from them
Demonstration
Assisted me
Other
Registrar
Watching them
Listening to them
Telling me
Feedback from them
Demonstration
Assisted me
Other


Edit Survey - Step 3 of 3
Please indicate how you learnt each of the selected items from step 2 by selecting an item from the left column and selecting one or more methods from the right column. Click 'Finish' to save and return to your surveys.
What I learnt
Learnt Item
Methods Specified
Content
Patient History 2
How to prescribe 0
How to prioritize 0
Administration
What to write in patient notes 0
How to access imaging results 0
How to access pathology results 0
Professional Identity
What to say to sound professional 0
How to work in a team 0
When to ask for help 0
My scope of practice 0
How I learnt
Method
Consultant
Registrar
Nurses
Other resources
Peers (Doctors)
Application of previous knowledge
Patient and/or Patient's Family
Allied Health Practitioner
Back to Step 2
Finish



Journal Entries

Journal Entry

Form is incomplete. Please fill out all required fields. | Options | Save

Entry Date: 7/11/2012

Journal:

Entry Date	Entry	Created On	Updated On
6/11/2012	Nothng to add. Works well. dont need to change anything.	6/11/2012 8:58 AM	
6/11/2012	just a little thing - will email	6/11/2012 7:00 PM	
12/10/2012	new journal entry test	4/10/2012 10:18 PM	30/10/2012 9:09 PM
10/10/2012	Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut la...	9/10/2012 6:42 PM	9/10/2012 6:43 PM
9/10/2012	xugahjalkfgkanflkgnalkdf	9/10/2012 6:55 PM	
8/10/2012	new journal entry test 2	4/10/2012 10:22 PM	
8/10/2012	Journal entry test	4/10/2012 9:45 PM	
2/03/2012	Journal Entry 3	2/03/2012 10:00 AM	4/10/2012 3:31 AM
1/03/2012	Journal Entry 1	1/03/2012 10:00 AM	4/10/2012 3:31 AM
1/03/2012	Journal Entry 2 Journal Entry 2 Journal Entry 2 Journal Entry 2 Journal Entry 2 Journal Entry 2...	1/03/2012 10:00 AM	3/10/2012 2:41 AM

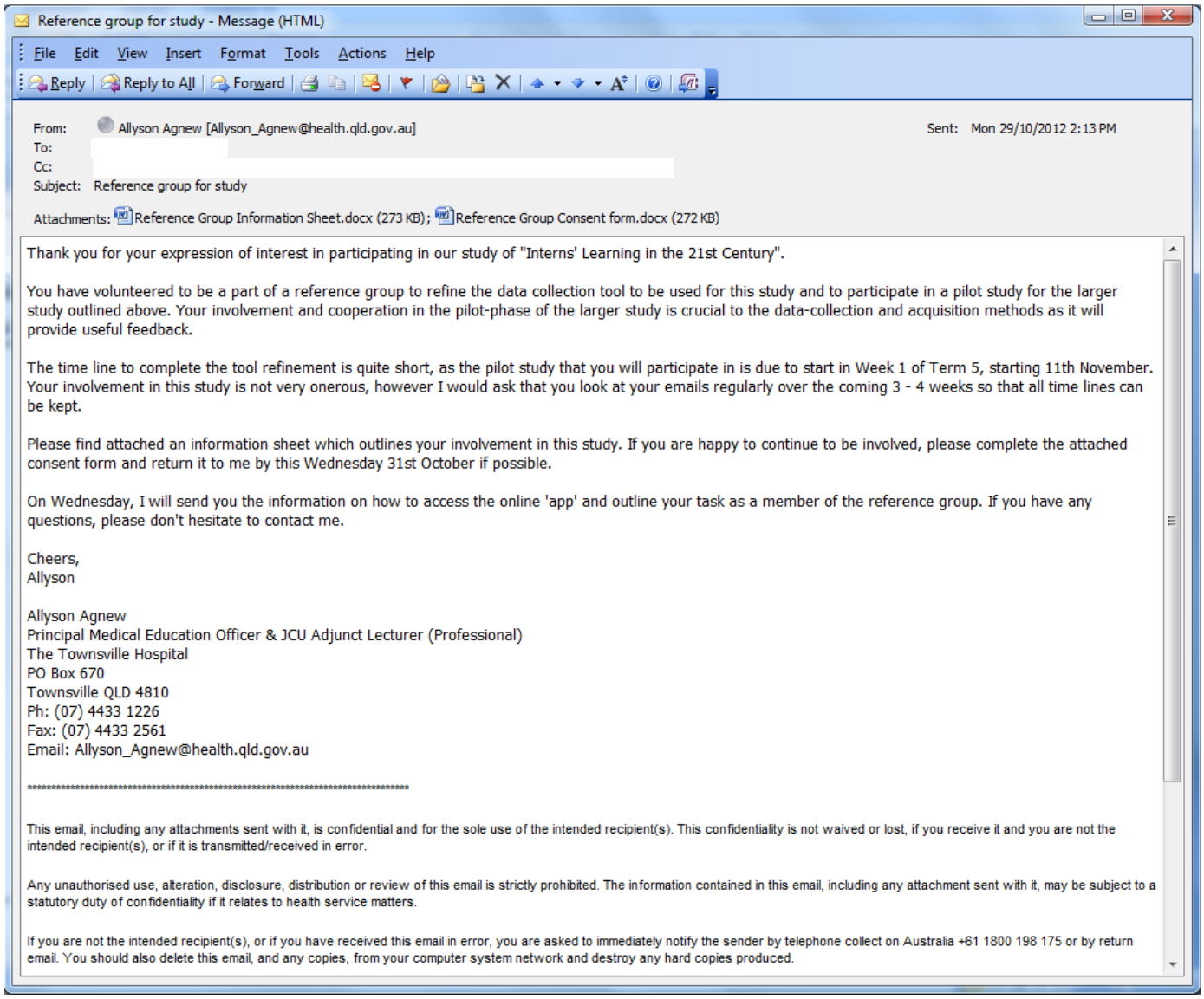
Page 1 of 1 | Page size: 10 | Displaying 1 - 10 of 10

Administration

Please select a task from the list below:

- Manage Categories - Manage categories of learnt items (Groups for 'What I learnt')
- Manage Learnt Items - Manage learnt items for each category (What I learnt)
- Manage Mentors - Manage mentors (Where I learnt it from)
- Manage Methods - Manage methods (How I learnt it)
- Manage Mentor Methods - Associate methods with mentors (The methods available for each mentor)
- Manage Rotations - Manage rotations
- Manage Surveys - Manage submitted surveys
- Manage Journal Entries - Manage submitted journal entries
- Manage Interns - Add new intern accounts
- Manage Users - Manage user accounts

APPENDIX 10 – EMAIL TO REFERENCE GROUP WITH INFORMATION SHEET & CONSENT FORM



Reference group for study - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

From: Allyson Agnew [Allyson_Agnew@health.qld.gov.au] Sent: Mon 29/10/2012 2:13 PM
To:
Cc:
Subject: Reference group for study

Attachments: Reference Group Information Sheet.docx (273 KB); Reference Group Consent form.docx (272 KB)

Thank you for your expression of interest in participating in our study of "Interns' Learning in the 21st Century".

You have volunteered to be a part of a reference group to refine the data collection tool to be used for this study and to participate in a pilot study for the larger study outlined above. Your involvement and cooperation in the pilot-phase of the larger study is crucial to the data-collection and acquisition methods as it will provide useful feedback.

The time line to complete the tool refinement is quite short, as the pilot study that you will participate in is due to start in Week 1 of Term 5, starting 11th November. Your involvement in this study is not very onerous, however I would ask that you look at your emails regularly over the coming 3 - 4 weeks so that all time lines can be kept.

Please find attached an information sheet which outlines your involvement in this study. If you are happy to continue to be involved, please complete the attached consent form and return it to me by this Wednesday 31st October if possible.

On Wednesday, I will send you the information on how to access the online 'app' and outline your task as a member of the reference group. If you have any questions, please don't hesitate to contact me.

Cheers,
Allyson

Allyson Agnew
Principal Medical Education Officer & JCU Adjunct Lecturer (Professional)
The Townsville Hospital
PO Box 670
Townsville QLD 4810
Ph: (07) 4433 1226
Fax: (07) 4433 2561
Email: Allyson_Agnew@health.qld.gov.au

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Queensland Government

JAMES COOK UNIVERSITY AUSTRALIA

Interns' Learning in the 21st Century

Information Sheet for Intern Reference Group

The current Australian medical internship is undertaken using an 'apprenticeship model' of teaching and learning. However the apprenticeship model of learning is ill-defined, especially in Australian hospital settings. You are invited to take part in a research project about the 'apprenticeship model' of teaching and learning for interns in Australia. The study is essentially trying to define what and how interns learn in modern clinical environments.

This study will inform providers of medical education and contribute towards best evidence medical education that will be used for benchmarking. It will also contribute towards a Doctor of Philosophy study being conducted under the supervision of the School of Medicine and Dentistry at James Cook University.

Studies often involve extensive research based on previous literature in the field, interviews and surveys from primary sources, and sometimes years of data collection and analysis. To aid in the project, many researchers create a pilot study: a small-scale version of the full study to test if the study's design will be able to capture the data they are looking for and provide a practical method of critiquing the testing measures and the reliability of the data.

You have been selected or have volunteered to be a part of a reference group to refine the data collection tool to be used for this study and to participate in a pilot study for the larger study outlined above. Your involvement and cooperation in the pilot-phase of the large study is crucial to the data-collection and acquisition methods as it will provide useful feedback. Your participation in this study will involve;

- Reviewing the online 'app' that will be used as the data collection tool and providing feedback via emails (A number of reviews over two weeks @ a maximum of 10 minutes or your time),
- Recording your learning from the 'First case of the day' each day for the first week of Term 5 (Total of 5 days @ a maximum of 10 minutes of your time per day),
- Keeping an additional reflective learning journal during these days (Total of 5 days @ a maximum of 15 minutes of your time per day), and
- Participating in a semi-structured interview the week after this data collection week (approximately 30 - 45 mintues). This semi-structured interview will further explore the information you have recorded and seek further feedback on the useability of the online 'app'.

As I am the Principal Researcher, I will be conducting this study, including the interviews. Taking part in this pilot study is completely voluntary and you can stop taking part in the pilot study at any time without explanation or prejudice. You may also withdraw any unprocessed data from the pilot study.

To assist you with your learning, you will receive a summary of your learning reflections towards the end of the year. The complete findings of this study will be made available to you once the thesis has been accepted by the School of Medicine and Dentistry at James Cook University some time in 2017. Parts of this study may be published in peer-reviewed journals prior to this. Please contact me or my Supervisor if you require any additional information.

Contact Details

Allyson Agnew
Principal Investigator
Postgraduate Medical Education Unit
& School of Medicine and Dentistry
James Cook University
Phone: 4433 1226
Email: allyson_agnew@health.qld.gov.au

Professor Tarun Sen Gupta
Supervisor
School of Medicine and Dentistry
James Cook University
Phone: 4781 6858
Email: tarun.sengupta@jcu.edu.au

If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811
Phone: (07) 4781 5011 (ethics@jcu.edu.au)

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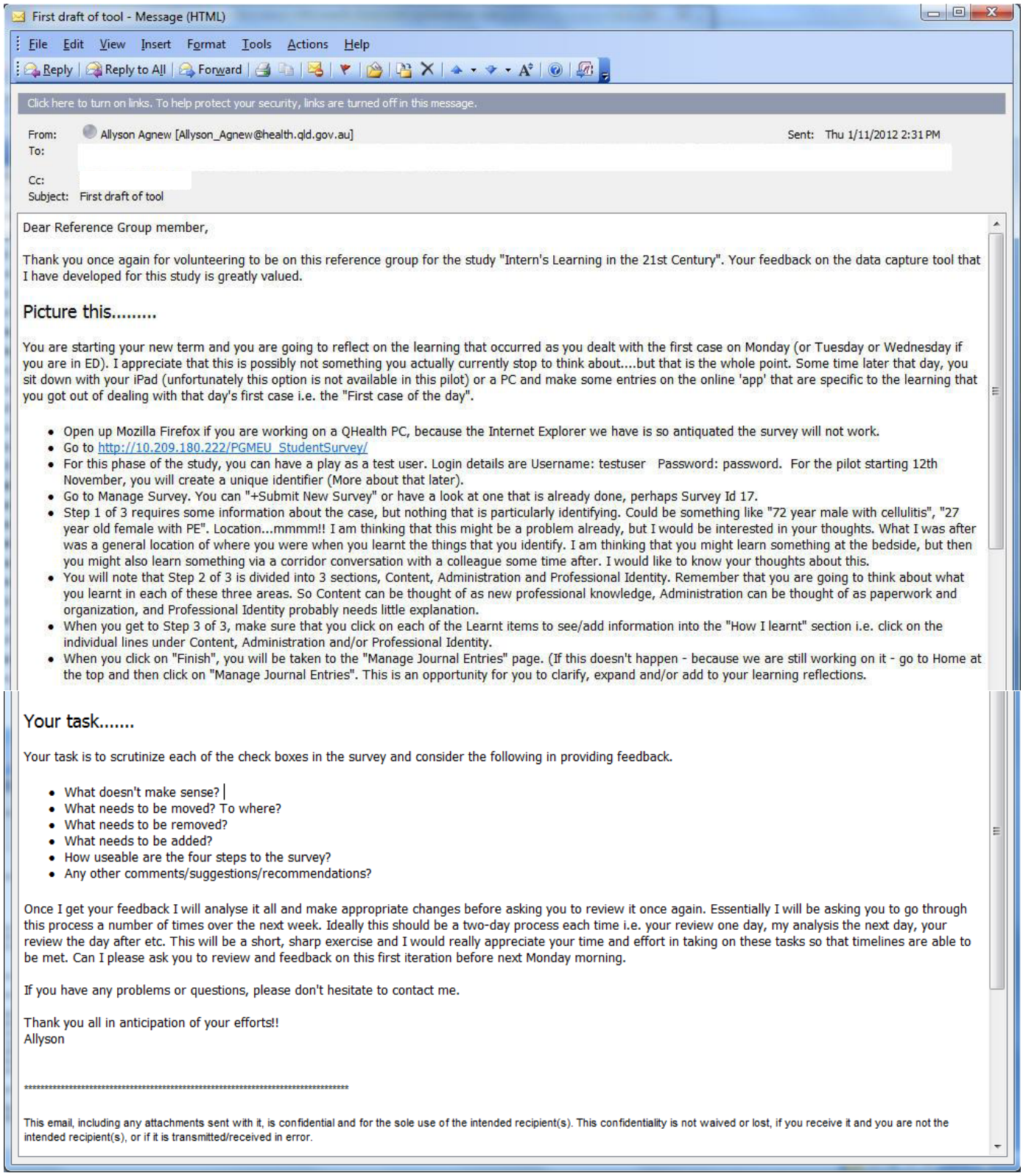
APPENDIX 13 – EMAIL TO REFERENCE GROUP RE FIRST DRAFT OF TOOL



First draft of tool - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

Click here to turn on links. To help protect your security, links are turned off in this message.

From: Allyson Agnew [Allyson_Agnew@health.qld.gov.au] Sent: Thu 1/11/2012 2:31 PM
To:
Cc:
Subject: First draft of tool

Dear Reference Group member,

Thank you once again for volunteering to be on this reference group for the study "Intern's Learning in the 21st Century". Your feedback on the data capture tool that I have developed for this study is greatly valued.

Picture this.....

You are starting your new term and you are going to reflect on the learning that occurred as you dealt with the first case on Monday (or Tuesday or Wednesday if you are in ED). I appreciate that this is possibly not something you actually currently stop to think about....but that is the whole point. Some time later that day, you sit down with your iPad (unfortunately this option is not available in this pilot) or a PC and make some entries on the online 'app' that are specific to the learning that you got out of dealing with that day's first case i.e. the "First case of the day".

- Open up Mozilla Firefox if you are working on a QHealth PC, because the Internet Explorer we have is so antiquated the survey will not work.
- Go to http://10.209.180.222/PGMEU_StudentSurvey/
- For this phase of the study, you can have a play as a test user. Login details are Username: testuser Password: password. For the pilot starting 12th November, you will create a unique identifier (More about that later).
- Go to Manage Survey. You can "+Submit New Survey" or have a look at one that is already done, perhaps Survey Id 17.
- Step 1 of 3 requires some information about the case, but nothing that is particularly identifying. Could be something like "72 year male with cellulitis", "27 year old female with PE". Location...mmmm!! I am thinking that this might be a problem already, but I would be interested in your thoughts. What I was after was a general location of where you were when you learnt the things that you identify. I am thinking that you might learn something at the bedside, but then you might also learn something via a corridor conversation with a colleague some time after. I would like to know your thoughts about this.
- You will note that Step 2 of 3 is divided into 3 sections, Content, Administration and Professional Identity. Remember that you are going to think about what you learnt in each of these three areas. So Content can be thought of as new professional knowledge, Administration can be thought of as paperwork and organization, and Professional Identity probably needs little explanation.
- When you get to Step 3 of 3, make sure that you click on each of the Learnt items to see/add information into the "How I learnt" section i.e. click on the individual lines under Content, Administration and/or Professional Identity.
- When you click on "Finish", you will be taken to the "Manage Journal Entries" page. (If this doesn't happen - because we are still working on it - go to Home at the top and then click on "Manage Journal Entries". This is an opportunity for you to clarify, expand and/or add to your learning reflections.

Your task.....

Your task is to scrutinize each of the check boxes in the survey and consider the following in providing feedback.

- What doesn't make sense?
- What needs to be moved? To where?
- What needs to be removed?
- What needs to be added?
- How useable are the four steps to the survey?
- Any other comments/suggestions/recommendations?

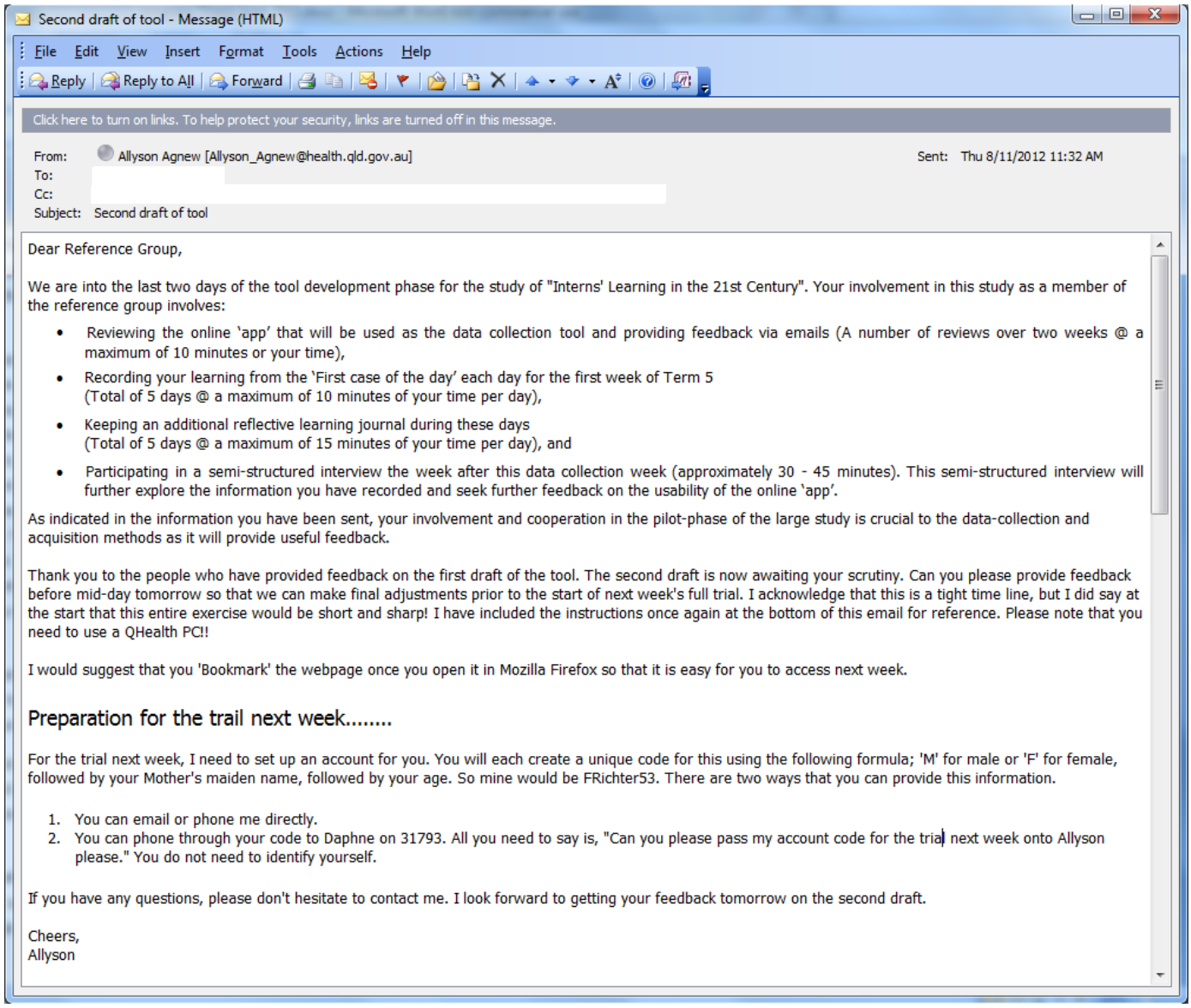
Once I get your feedback I will analyse it all and make appropriate changes before asking you to review it once again. Essentially I will be asking you to go through this process a number of times over the next week. Ideally this should be a two-day process each time i.e. your review one day, my analysis the next day, your review the day after etc. This will be a short, sharp exercise and I would really appreciate your time and effort in taking on these tasks so that timelines are able to be met. Can I please ask you to review and feedback on this first iteration before next Monday morning.

If you have any problems or questions, please don't hesitate to contact me.

Thank you all in anticipation of your efforts!!
Allyson

****

APPENDIX 14 – EMAIL TO REFERENCE GROUP RE SECOND DRAFT OF TOOL



Second draft of tool - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

Click here to turn on links. To help protect your security, links are turned off in this message.

From: Allyson Agnew [Allyson_Agnew@health.qld.gov.au] Sent: Thu 8/11/2012 11:32 AM
To:
Cc:
Subject: Second draft of tool

Dear Reference Group,

We are into the last two days of the tool development phase for the study of "Interns' Learning in the 21st Century". Your involvement in this study as a member of the reference group involves:

- Reviewing the online 'app' that will be used as the data collection tool and providing feedback via emails (A number of reviews over two weeks @ a maximum of 10 minutes or your time),
- Recording your learning from the 'First case of the day' each day for the first week of Term 5
  (Total of 5 days @ a maximum of 10 minutes of your time per day),
- Keeping an additional reflective learning journal during these days
  (Total of 5 days @ a maximum of 15 minutes of your time per day), and
- Participating in a semi-structured interview the week after this data collection week (approximately 30 - 45 minutes). This semi-structured interview will further explore the information you have recorded and seek further feedback on the usability of the online 'app'.

As indicated in the information you have been sent, your involvement and cooperation in the pilot-phase of the large study is crucial to the data-collection and acquisition methods as it will provide useful feedback.

Thank you to the people who have provided feedback on the first draft of the tool. The second draft is now awaiting your scrutiny. Can you please provide feedback before mid-day tomorrow so that we can make final adjustments prior to the start of next week's full trial. I acknowledge that this is a tight time line, but I did say at the start that this entire exercise would be short and sharp! I have included the instructions once again at the bottom of this email for reference. Please note that you need to use a QHealth PC!!

I would suggest that you 'Bookmark' the webpage once you open it in Mozilla Firefox so that it is easy for you to access next week.

Preparation for the trail next week.....

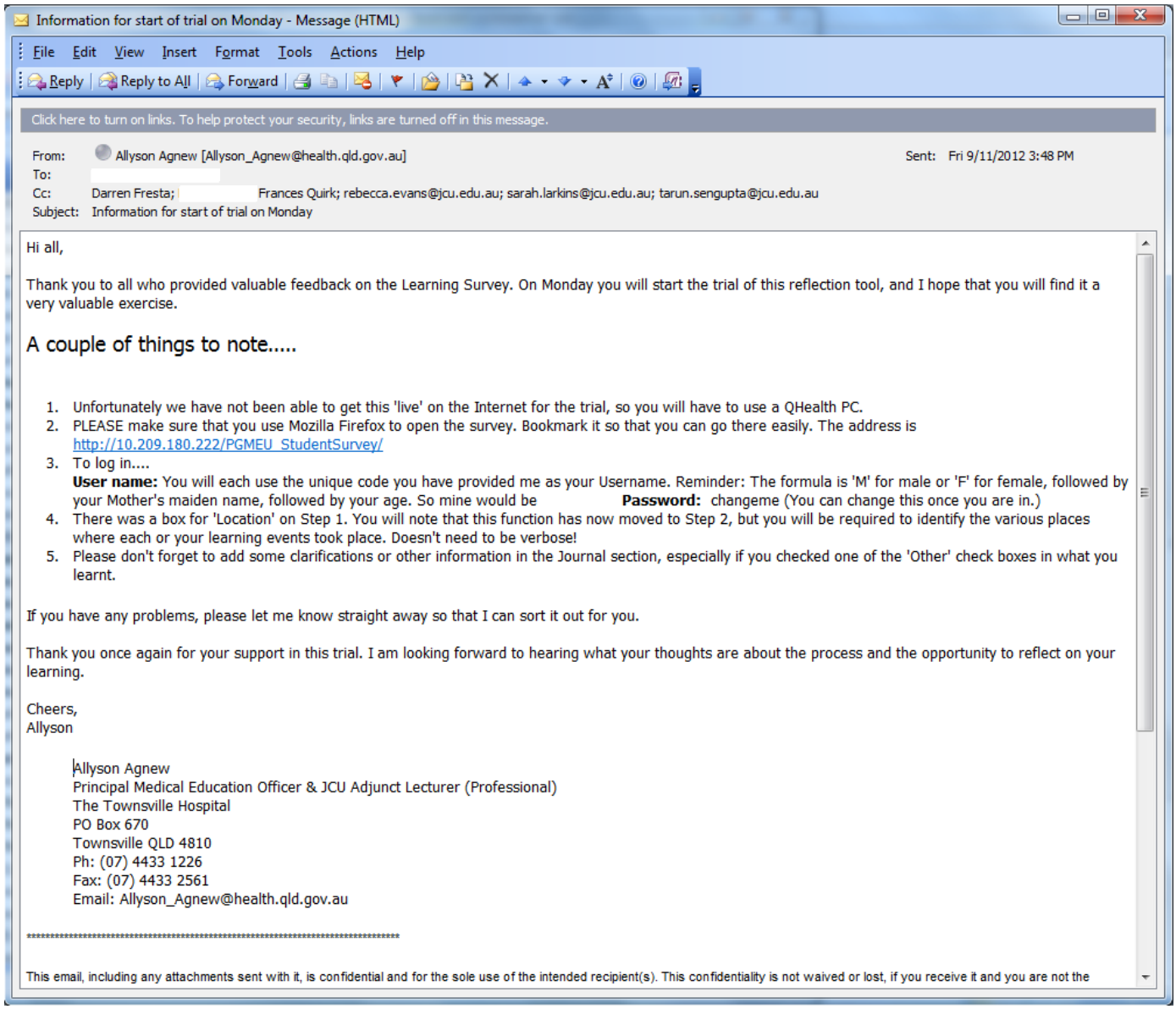
For the trial next week, I need to set up an account for you. You will each create a unique code for this using the following formula; 'M' for male or 'F' for female, followed by your Mother's maiden name, followed by your age. So mine would be FRichter53. There are two ways that you can provide this information.

1. You can email or phone me directly.
2. You can phone through your code to Daphne on 31793. All you need to say is, "Can you please pass my account code for the trial next week onto Allyson please." You do not need to identify yourself.

If you have any questions, please don't hesitate to contact me. I look forward to getting your feedback tomorrow on the second draft.

Cheers,
Allyson

APPENDIX 15 – EMAIL TO REFERENCE GROUP RE START OF TRIAL



Information for start of trial on Monday - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

Click here to turn on links. To help protect your security, links are turned off in this message.

From: Allyson Agnew [Allyson_Agnew@health.qld.gov.au] Sent: Fri 9/11/2012 3:48 PM
To:
Cc: Darren Fresta; Frances Quirk; rebecca.evans@jcu.edu.au; sarah.larkins@jcu.edu.au; tarun.sengupta@jcu.edu.au
Subject: Information for start of trial on Monday

Hi all,

Thank you to all who provided valuable feedback on the Learning Survey. On Monday you will start the trial of this reflection tool, and I hope that you will find it a very valuable exercise.

A couple of things to note.....

1. Unfortunately we have not been able to get this 'live' on the Internet for the trial, so you will have to use a QHealth PC.
2. PLEASE make sure that you use Mozilla Firefox to open the survey. Bookmark it so that you can go there easily. The address is http://10.209.180.222/PGMEU_StudentSurvey/
3. To log in....
   User name: You will each use the unique code you have provided me as your Username. Reminder: The formula is 'M' for male or 'F' for female, followed by your Mother's maiden name, followed by your age. So mine would be **Password:** changeme (You can change this once you are in.)
4. There was a box for 'Location' on Step 1. You will note that this function has now moved to Step 2, but you will be required to identify the various places where each or your learning events took place. Doesn't need to be verbose!
5. Please don't forget to add some clarifications or other information in the Journal section, especially if you checked one of the 'Other' check boxes in what you learnt.

If you have any problems, please let me know straight away so that I can sort it out for you.

Thank you once again for your support in this trial. I am looking forward to hearing what your thoughts are about the process and the opportunity to reflect on your learning.

Cheers,
Allyson

Allyson Agnew
Principal Medical Education Officer & JCU Adjunct Lecturer (Professional)
The Townsville Hospital
PO Box 670
Townsville QLD 4810
Ph: (07) 4433 1226
Fax: (07) 4433 2561
Email: Allyson_Agnew@health.qld.gov.au

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This email, including any attachments sent with it, is confidential and for the sole use of the intended recipient(s). This confidentiality is not waived or lost, if you receive it and you are not the

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JAMES COOK UNIVERSITY
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Interns' Learning in the 21st Century

Townsville PGMEU Learning Survey

Manual for use of the online 'app' at

http://pgmeu-survey.townsvillehospital.com

Contact Details

Allyson Agnew
Principal Investigator
Postgraduate Medical Education Unit
& School of Medicine and Dentistry, James Cook University
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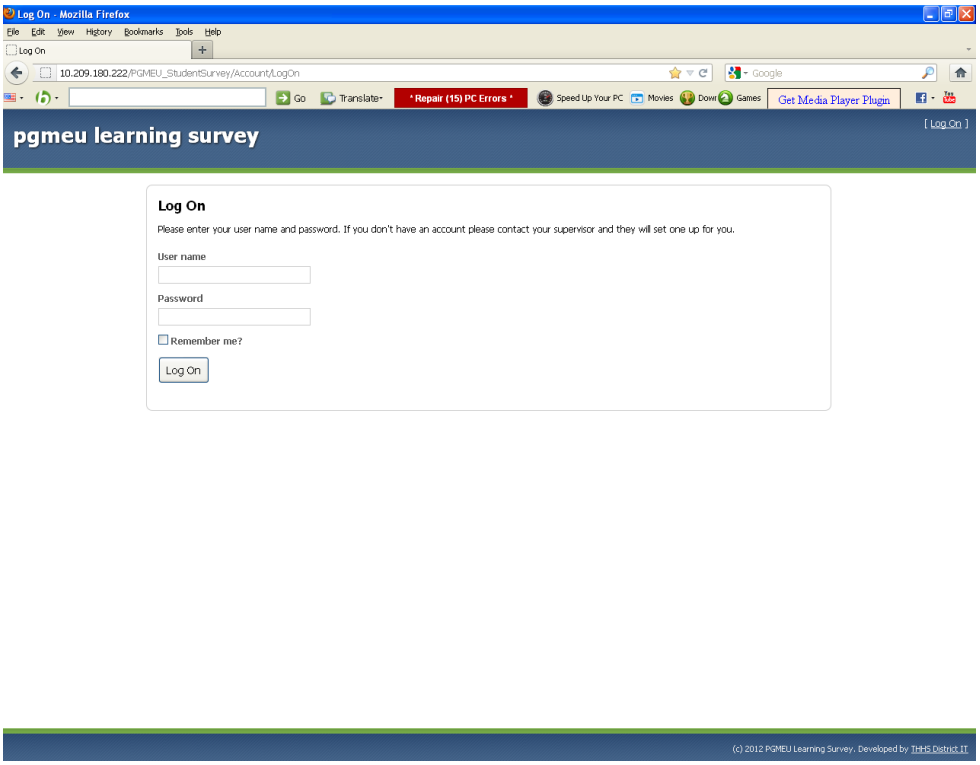
Professor Tarun Sen Gupta
Supervisor
School of Medicine and Dentistry
James Cook University
Phone: 4781 6858
Email: tarun.sengupta@jcu.edu.au

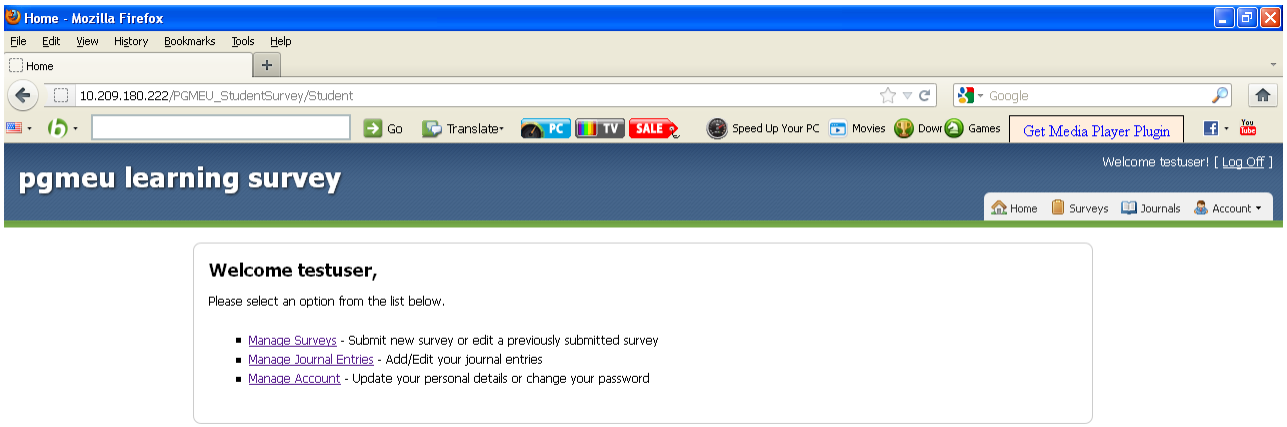
The following instructions are to assist you in the use of the *PGMEU Learning Survey* 'app'. On each of the days in your first week each of your rotations, you are going to reflect on the learning that occurred as you dealt with the first case of each day i.e. the first case on Monday (or Tuesday or Wednesday if you are in ED). I appreciate that this is possibly not something you actually currently stop to think about....but that is the whole point.

Some time later that day, you will sit down with your iPad or a PC and make some entries on the online 'app' that are specific to the learning that you got out of dealing with that day's first case i.e. the "First case of the day".

- Open up Mozilla Firefox if you are working on a QHealth PC, because the Internet Explorer we have is so antiquated the survey will not work.
- Go to http://pgmeu-survey.townsvillehospital.com

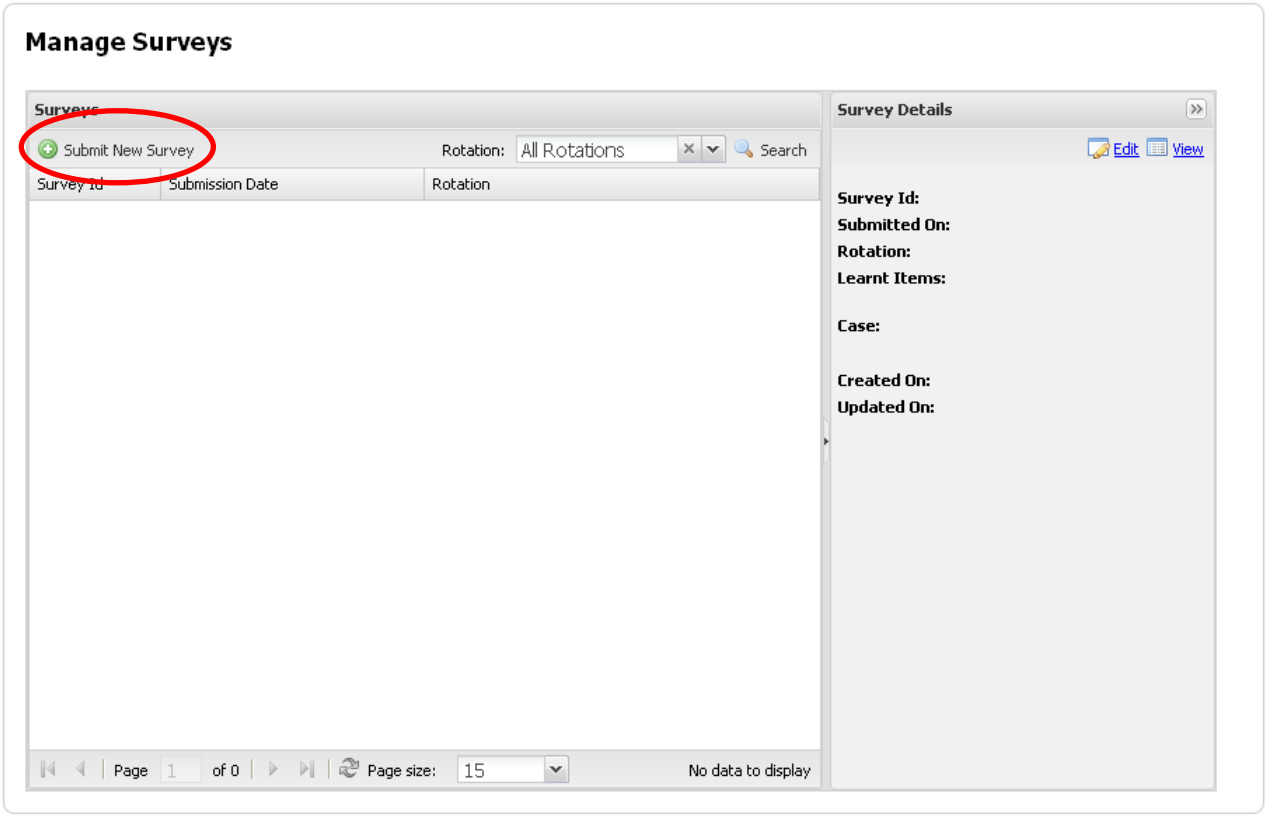


- Login details are the unique **Username** you have provided. (Reminder: 'M' for male or 'F' for female, followed by your Mother's maiden name, followed by your age. So mine would be FRichter21..... of course I'm only 21!!), and the **Password** will initially be changeme. You can change this to something that you will remember using 'Manage Account'.

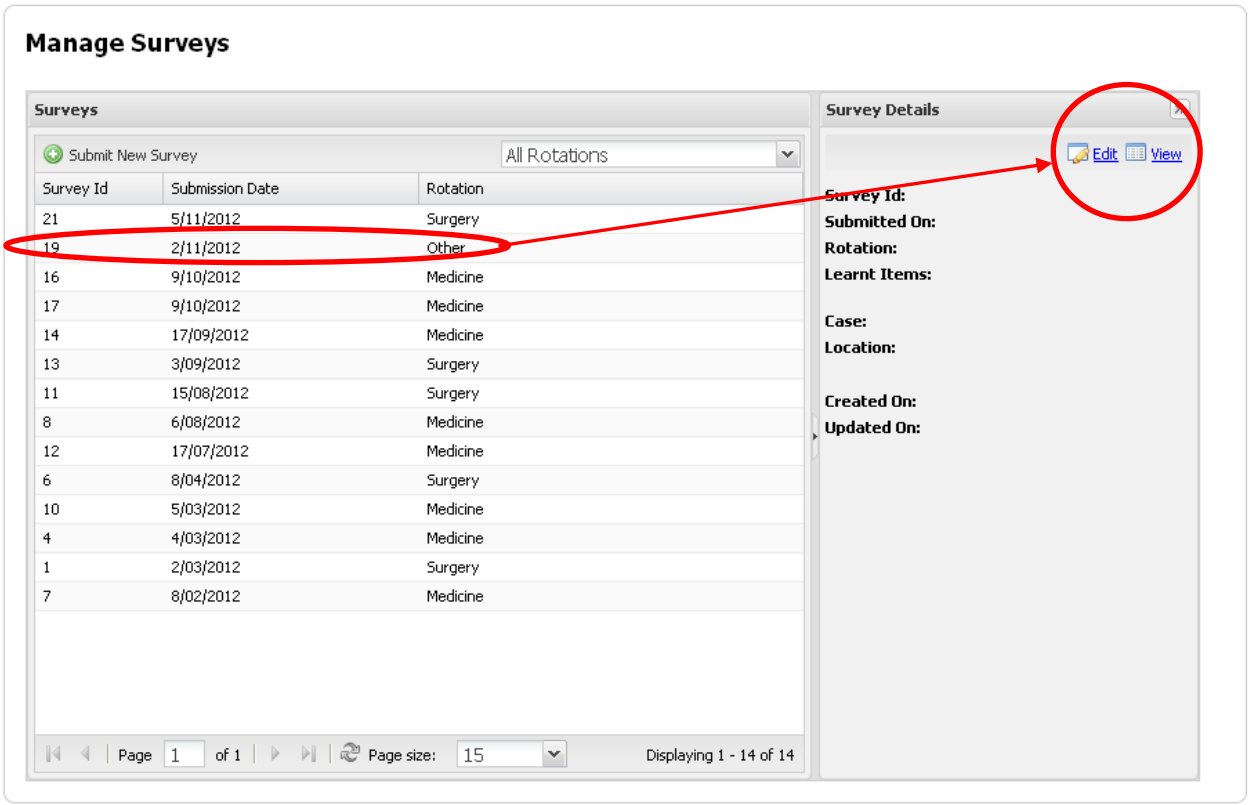


- Click on 'Manage Survey'.

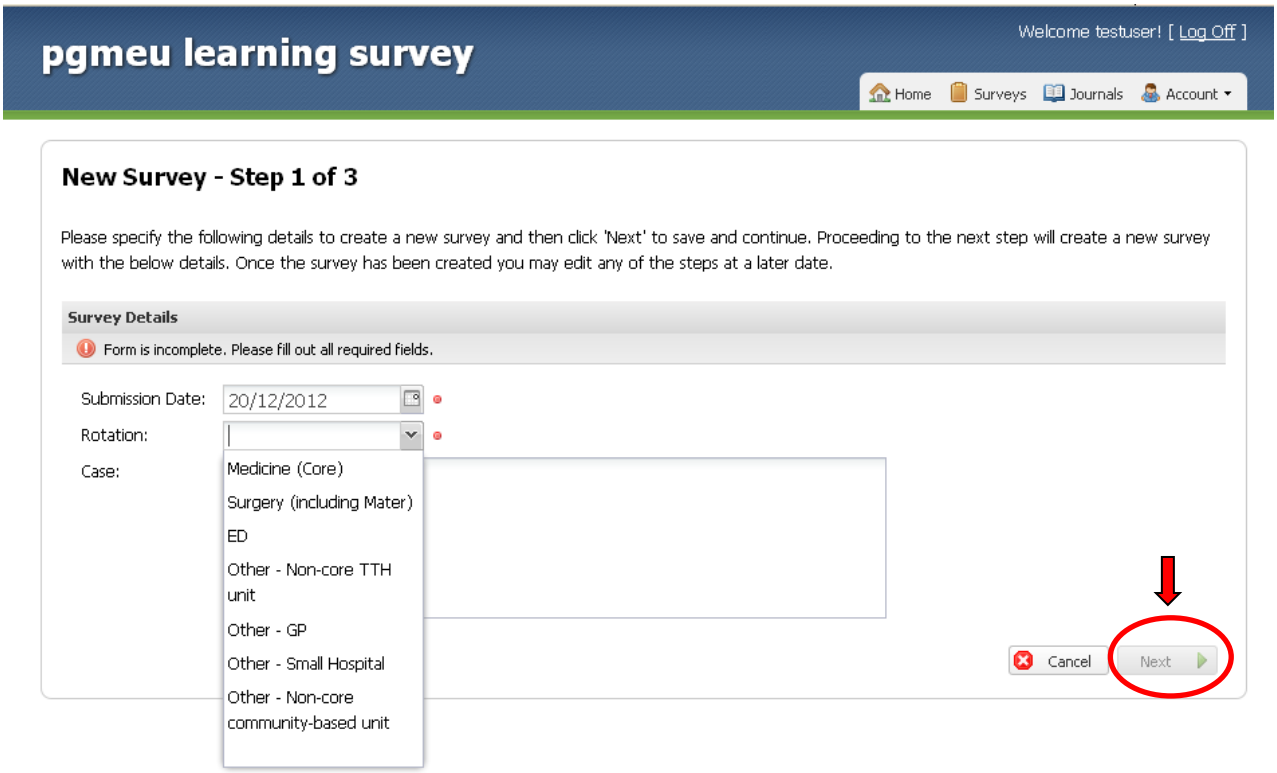
- Start a new entry by clicking ‘Submit New Survey’.



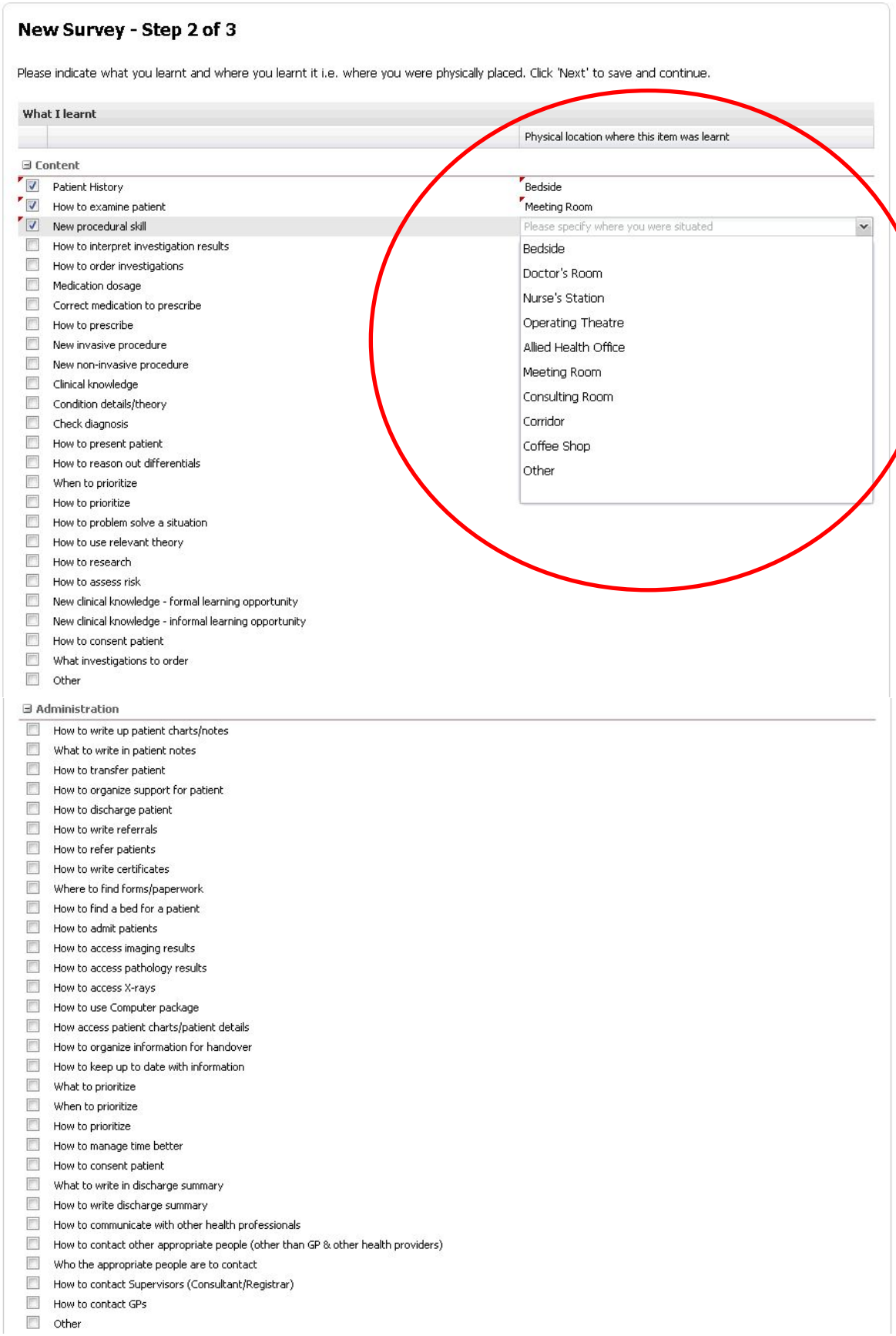
- You can view or edit past entries by highlighting an entry and clicking on either ‘Edit’ or ‘View’.

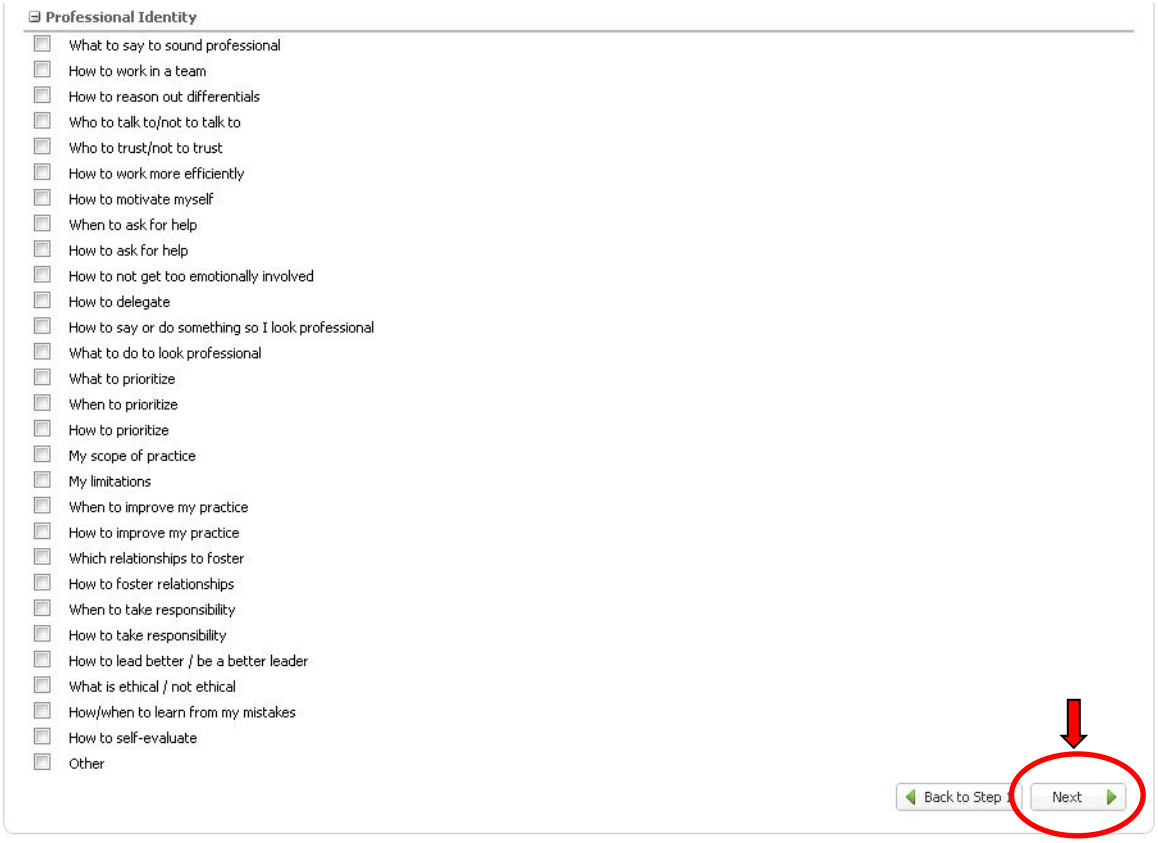


- Enter the details required for Step1 of 3. This step requires some information about the case, but nothing that is particularly identifying. Could be something like "72 year old male with Cellulitis", "27 year old female with PE". When you have finished, click ‘Next’.

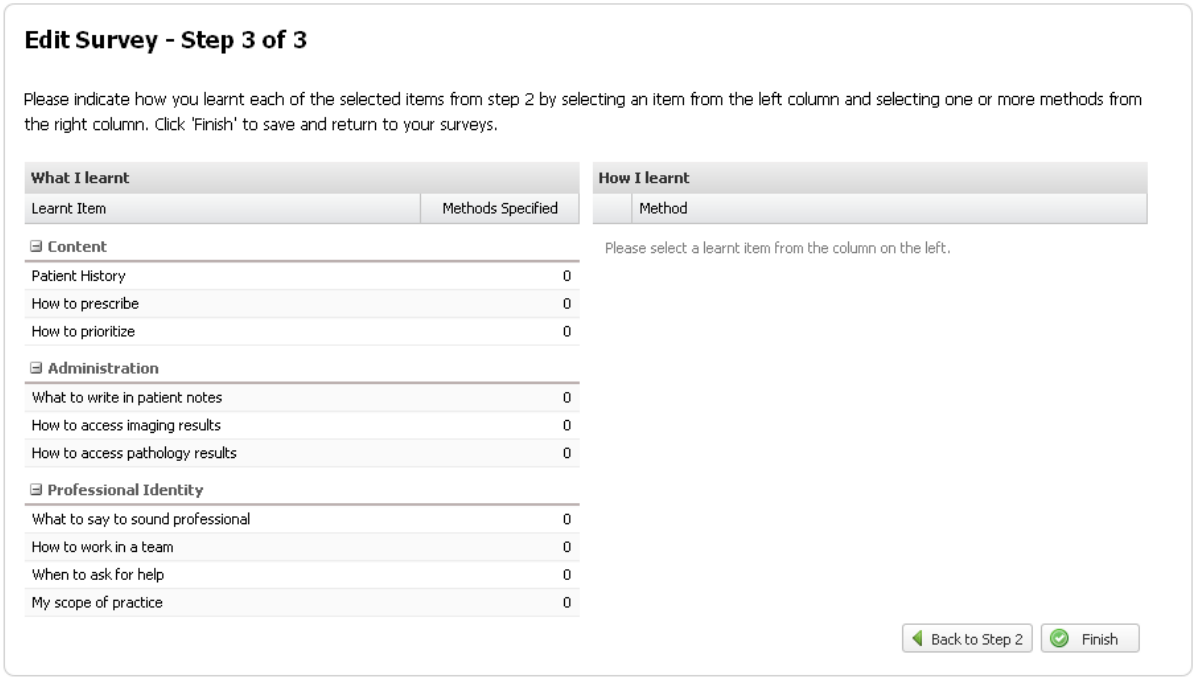


- You will note that Step 2 of 3 is divided into 3 sections, Content, Administration and Professional Identity. Remember that you are going to think about what you learnt in each of these three areas. So Content can be thought of as new professional knowledge, Administration can be thought of as paperwork and organization, and Professional Identity probably needs little explanation.

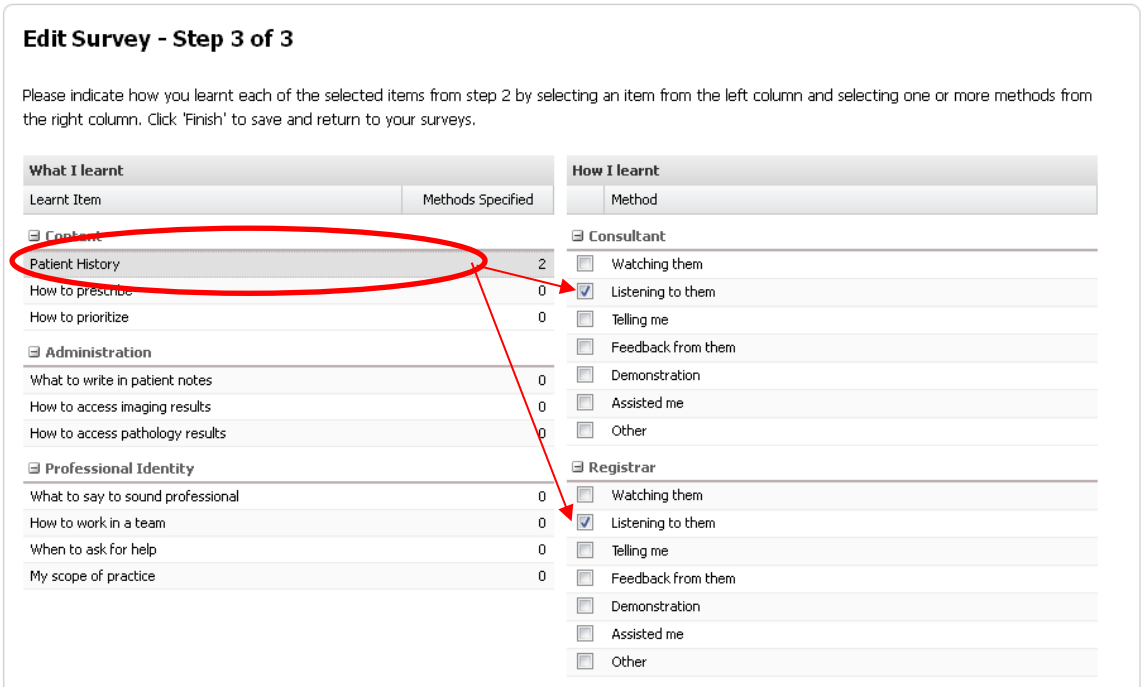




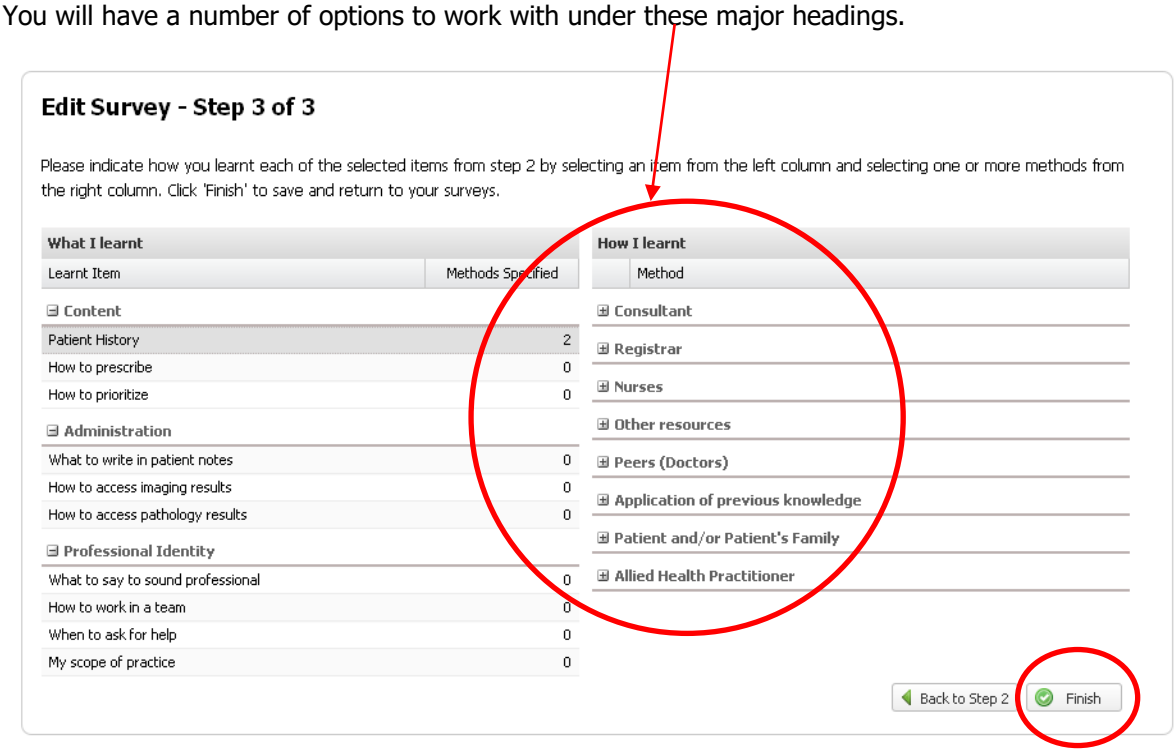
- When you get to Step 3 of 3, you will see that the things you have chosen in Step 2 have been pre-populated into this page. This page is looking at how you learnt i.e. the method by which you learn each item you checked in Step 2.



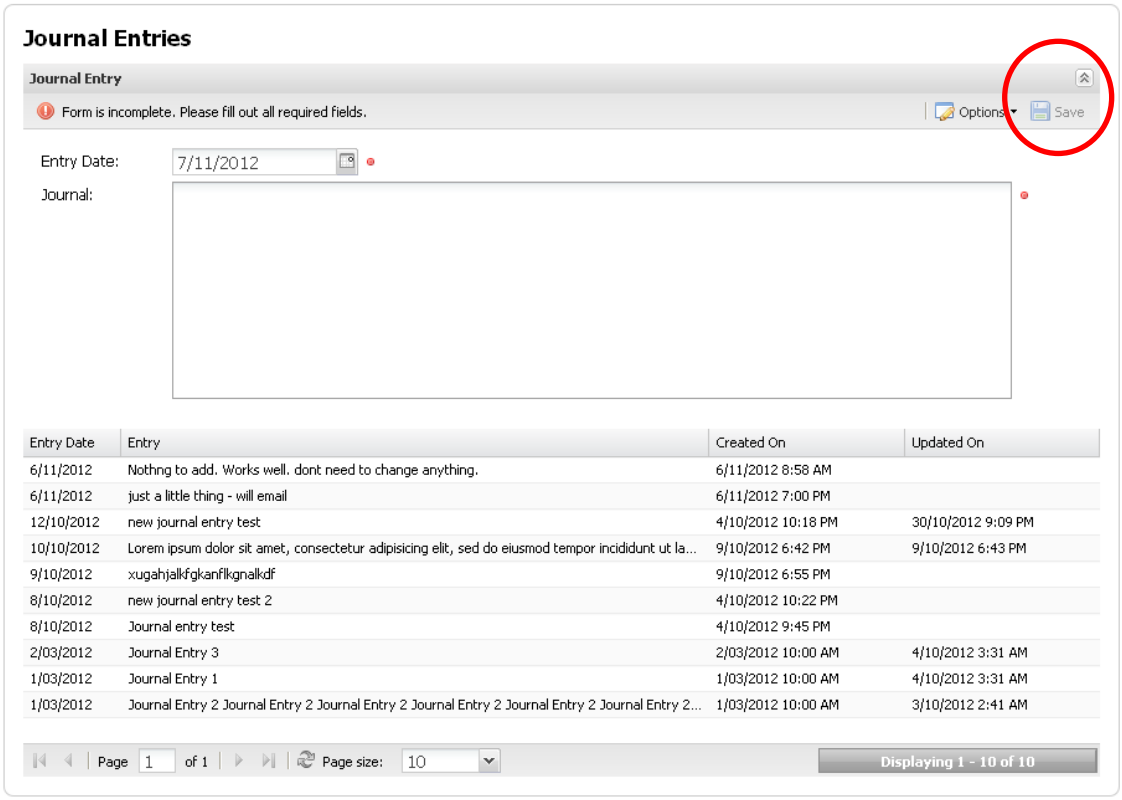
- Make sure that you click on each of the 'Learnt Items' to see/add information into the 'How I learnt' section i.e. click on the individual lines under Content, Administration and/or Professional Identity.



- You will have a number of options to work with under these major headings.



- When you click on 'Finish', you will be taken to the 'Manage Journal Entries' page. This is an opportunity for you to clarify, expand and/or add to your learning reflections, especially if you checked one or more of the 'Other' checkboxes in the Step 2.



- Don't forget to hit 'Save' after you have finished your journal entry.
- You can view or edit past entries by highlighting an entry and clicking.

Thank you for making time to complete your surveys and happy reflecting.

If you have any questions at any time, please do not hesitate to contact me.

Allyson Agnew
Desk phone # 31226
DECT phone # 33197
Mobile: 0409 759 734

Queensland Government

JAMES COOK UNIVERSITY AUSTRALIA

Guide for Intern Interviews

PRINCIPAL INVESTIGATOR	**Allyson Agnew**
PROJECT TITLE:	**Interns' Learning in the 21st Century**
SCHOOL	**Medicine & Dentistry**

Thank you for consenting to participate in the interview phase of my study. The aim of this research study is to explore the concept of 'apprenticeship' learning for interns in Australia. Results of this study will add to what is known about how interns learn.

You have consented for the interview to be audio taped. All data collected from you will be kept strictly confidential and will be unidentifiable, including this interview. No names will be used to identify you with this study without your approval.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. You have agreed that as the researcher, I may use the results as described in the information sheet, however you may withdraw any unprocessed data from the study.

Do you feel comfortable? Are you ready to start?

❑ Demographics
- I don't need your name recorded in this interview, but for demographic purposes, can you please tell me how old you are or which age bracket you are in? <25, 25-29, 30-34, 35-39, 40-44, 45-50, >50
- Was your medical degree an undergraduate or postgraduate degree?
- What was the predominant type of teaching you had in that degree? Was it didactic, problem-based or some other type of teaching?

❑ How do you think you learn while you are working clinically?
- What do you think is the best way for you to learn while you are working?
- What do you think is the least useful method or you to learn while you are working?

❑ What do you think is the role of the Consultant in your learning?

❑ What do you think is the role of the Registrar in your learning?

❑ When you were a student, one of the main reasons you learnt was probably that you had to pass exams. What do you think are the main drivers for what you learn now that you are working and learning on the job?

❑ If you could create the ideal learning situation in your Internship, what would it look like?

❑ In the learning reflection survey, you checked learnt items under the headings of content, administration and professional identity.
- How important do you think it is to learn things around the content category?
- How important do you think it is to learn things around the administration category?
- How important do you think it is to learn things around the professional identity category?
- If you had to rank the content, administration and professional identity categories from one being most important to three being least important, how would you rank them?

❑ An Internship is often considered a medical apprenticeship. What do you think that means? How do you think it works?

Thank you very much for participating in the interview phase of this study. I will transcribe this interview and send you copy so that you can check it for errors. The results of all of the interviews I am carrying out will eventually be used to write a paper. I will provide you with a copy of this paper when it is complete. Thank you once again.

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JAMES COOK UNIVERSITY AUSTRALIA

Guide for Supervisor Interviews

PRINCIPAL INVESTIGATOR	**Allyson Agnew**
PROJECT TITLE:	**Interns' Learning in the 21st Century**
SCHOOL	**Medicine & Dentistry**

Thank you for consenting to participate in the interview phase of my study. The aim of this research study is to explore the concept of 'apprenticeship' learning for interns in Australia. Results of this study will add to what is known about how interns learn.

You have consented for the interview to be audio taped. All data collected from you will be kept strictly confidential and will be unidentifiable, including this interview. No names will be used to identify you with this study without your approval.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. You have agreed that as the researcher, I may use the results as described in the information sheet, however you may withdraw any unprocessed data from the study.

Do you feel comfortable? Are you ready to start?

❑ Demographics

- I don't need your name recorded in this interview, but for demographic purposes, can you please tell me which age bracket you are in? 35-39, 40-44, 45-59, 50-54, 55-59, 60-65, >65
- Can you please tell me in which country you did your medical degree?
- Can you please tell me how many years it is since you graduated from University?
- Can you please tell me in which country you did your internship and junior doctor training?
- Can you please tell me how long you have been qualified as a Consultant?

❑ This study is investigating how interns learn. Could you tell me about how you think interns learn while they are working clinically?

- What do you think is the best way for interns to learn while they are working?
- What do you think is the least useful way for interns to learn while they are working?

❑ What do you think is the role of the Registrar in interns' learning?

❑ What do you think your role is in interns' learning?

❑ When interns were students, one of the main drivers for learning was probably that they had to pass exams. What do you think are the main drivers for what interns learn now that they are working and learning on the job?

❑ If you could create the ideal learning situation for Internships, what would it look like?

❑ I have developed a learning reflection survey that interns have been using (Show a copy of Step 2 of the Survey). In this survey, interns have been checking learnt items under the headings of content, administration and professional identity.

- How important do you think it is for interns to learn things around content?
- How important do you think it is for interns to learn things around administration?
- How important do you think it is for interns to learn things around professional identity?
- If you had to rank the content, administration and professional identity categories from one being most important to three being least important, how would you rank them?

❑ An Internship is often considered a medical apprenticeship.

- What do you think that means?
- How do you think it works?

Thank you very much for participating in the interview phase of this study. I will transcribe this interview and send you copy so that you can check it for errors. The results of all of the interviews I am carrying out will eventually be used to write a paper. I will provide you with a copy of this paper when it is complete. Thank you once again.

Queensland Government

JAMES COOK UNIVERSITY AUSTRALIA

Interns' Learning in the 21st Century

Information Sheet for Supervisors of Interns

The current Australian medical internship is undertaken using an 'apprenticeship model' of teaching and learning. However the apprenticeship model of learning is ill-defined, especially in Australian hospital settings. You are invited to take part in a research project about the 'apprenticeship model' of teaching and learning for interns in Australia. The study is essentially trying to define what and how interns learn in modern clinical environments.

This study will inform providers of medical education and contribute towards best evidence medical education that will be used for benchmarking. It will also contribute towards a Doctor of Philosophy study being conducted under the supervision of the School of Medicine and Dentistry at James Cook University.

Your participation in this study will involve;

- Participating in semi-structured interviews (1 – 2 interviews @ approximately 20 – 30 minutes). These semi-structured interviews will explore your understanding of the concept of 'apprenticeship' learning for interns in Australia and your perceptions of what your 'apprentice' interns have learnt during the first week of each term.

As I am the Principal Researcher, I will be conducting this study, including the interviews. Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. You may also withdraw any unprocessed data from the study.

The complete findings of this study will be made available to you once the thesis has been accepted by the School of Medicine and Dentistry at James Cook University some time in 2017. Parts of this study may be published in peer-reviewed journals prior to this. Please contact me or my Supervisor if you require any additional information.

Contact Details

Allyson Agnew
Principal Investigator
Postgraduate Medical Education Unit
& School of Medicine and Dentistry, James Cook University
Phone: 4433 1226
Email: allyson_agnew@health.qld.gov.au

Professor Tarun Sen Gupta
Supervisor
School of Medicine and Dentistry
James Cook University
Phone: 4781 6858
Email: tarun.sengupta@jcu.edu.au

If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811
Phone: (07) 4781 5011 (ethics@jcu.edu.au)

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Queensland Government

JAMES COOK UNIVERSITY AUSTRALIA

Interns' Learning in the 21st Century

Information Sheet for Interns

The current Australian medical internship is undertaken using an 'apprenticeship model' of teaching and learning. However the apprenticeship model of learning is ill-defined, especially in Australian hospital settings. You are invited to take part in a research project about the 'apprenticeship model' of teaching and learning for interns in Australia. The study is essentially trying to define what and how interns learn in modern clinical environments.

This study will inform providers of medical education and contribute towards best evidence medical education that will be used for benchmarking. It will also contribute towards a Doctor of Philosophy study being conducted under the supervision of the School of Medicine and Dentistry at James Cook University.

Your participation in this study will involve;

- Recording your learning from the 'First case of the day' each day for the first week of each of the core terms of Medicine, Surgery and Emergency Medicine
  (Total of 15 days @ a maximum of 10 minutes of your time per day),
- Keeping an additional reflective learning journal during these days
  (Total of 15 days @ a maximum of 15 minutes of your time per day), and
- Participating in semi-structured interviews the week after these data collection weeks (approximately 2 @ 30 - 45 mintues and 1 @ 45 - 60 minutes). These semi-structured interviews will further explore the information you have recorded.

As I am the Principal Researcher, I will be conducting this study, including the interviews. Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. You may also withdraw any unprocessed data from the study.

To assist you with your learning, you will receive a summary of your learning reflections towards the end of each of your core terms. The complete findings of this study will be made available to you once the thesis has been accepted by the School of Medicine and Dentistry at James Cook University some time in 2017. Parts of this study may be published in peer-reviewed journals prior to this. Please contact me or my Supervisor if you require any additional information.

Contact Details

Allyson Agnew
Principal Investigator
Postgraduate Medical Education Unit
& School of Medicine and Dentistry, James Cook University
Phone: 4433 1226
Email: allyson_agnew@health.qld.gov.au

Professor Tarun Sen Gupta
Supervisor
School of Medicine and Dentistry
James Cook University
Phone: 4781 6858
Email: tarun.sengupta@jcu.edu.au

If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811
Phone: (07) 4781 5011 (ethics@jcu.edu.au)

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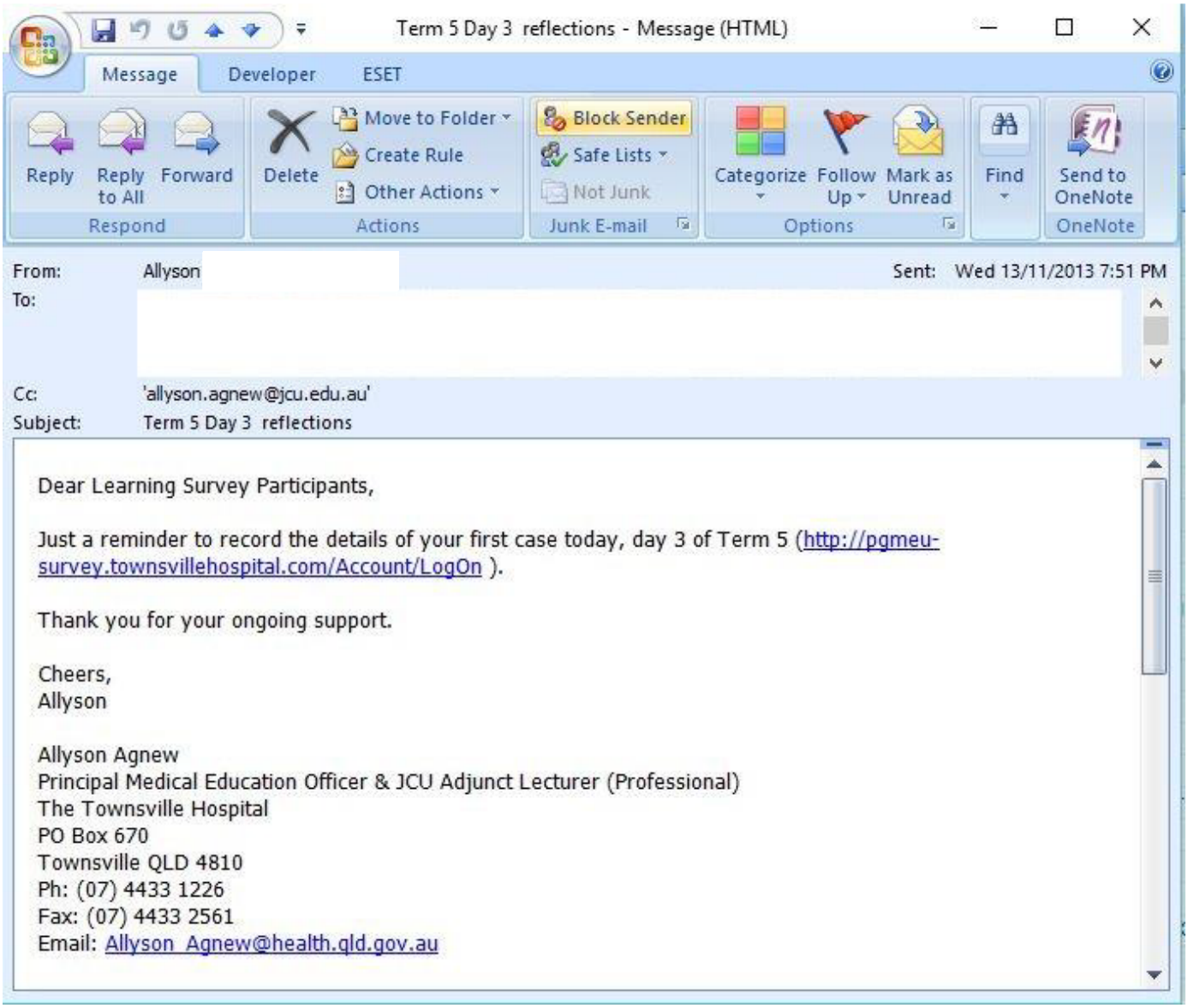
APPENDIX 23 – REMINDER EMAIL TO STUDY PARTICIPANTS



APPENDIX 24 – EXAMPLE LRS APP SURVEY .CSV FILE DATA

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Student	SurveyDate	Case	Term	Rotation	CategoryI	Category	LearntItemI	LearntItem	LocationIc	Location	MentorIc	Mentor	MethodIc	Method
50	4/09/2014	47 year old lady with syncope	4	Medicine	2	Administration	64	How to communicate v	2	Doctor's Room	2	Registrar	5	Demonstration
50	4/09/2014	47 year old lady with syncope	4	Medicine	2	Administration	64	How to communicate v	2	Doctor's Room	2	Registrar	6	Assisted me
50	4/09/2014	47 year old lady with syncope	4	Medicine	2	Administration	64	How to communicate v	2	Doctor's Room	6	Application of previous knowled	26	Uni knowledge
50	4/09/2014	47 year old lady with syncope	4	Medicine	2	Administration	64	How to communicate v	2	Doctor's Room	6	Application of previous knowled	27	Personal experience
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	1	Patient's History	1	Bedside	1	Consultant	1	Watching them
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	1	Patient's History	1	Bedside	6	Application of previous knowled	26	Uni knowledge
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	6	How to interpret investi	2	Doctor's Room	1	Consultant	3	Telling me
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	6	How to interpret investi	2	Doctor's Room	2	Registrar	6	Assisted me
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	6	How to interpret investi	2	Doctor's Room	6	Application of previous knowled	27	Personal experience
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	7	How to order investigat	2	Doctor's Room	1	Consultant	3	Telling me
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	7	How to order investigat	2	Doctor's Room	2	Registrar	6	Assisted me
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	7	How to order investigat	2	Doctor's Room	6	Application of previous knowled	26	Uni knowledge
50	4/09/2014	47 year old lady with syncope	4	Medicine	1	Content	7	How to order investigat	2	Doctor's Room	6	Application of previous knowled	27	Personal experience
50	4/09/2014	47 year old lady with syncope	4	Medicine	3	Professional Identit	33	How to work in a team	1	Bedside	1	Consultant	1	Watching them
50	4/09/2014	47 year old lady with syncope	4	Medicine	3	Professional Identit	33	How to work in a team	1	Bedside	1	Consultant	2	Listening to them
50	4/09/2014	47 year old lady with syncope	4	Medicine	3	Professional Identit	33	How to work in a team	1	Bedside	2	Registrar	1	Watching them
50	4/09/2014	47 year old lady with syncope	4	Medicine	3	Professional Identit	33	How to work in a team	1	Bedside	2	Registrar	2	Listening to them
50	4/09/2014	47 year old lady with syncope	4	Medicine	3	Professional Identit	33	How to work in a team	1	Bedside	6	Application of previous knowled	27	Personal experience
46	5/09/2014	68yo M post ileostomy	4	Surgery (i	2	Administration	21	How to discharge patie	2	Doctor's Room	4	Other resources	14	Formal education session
46	5/09/2014	68yo M post ileostomy	4	Surgery (i	2	Administration	21	How to discharge patie	2	Doctor's Room	5	Peers (Doctors)	28	Answer to my question/s
46	5/09/2014	68yo M post ileostomy	4	Surgery (i	2	Administration	21	How to discharge patie	2	Doctor's Room	6	Application of previous knowled	27	Personal experience
46	5/09/2014	68yo M post ileostomy	4	Surgery (i	2	Administration	57	What to prioritize	3	Nurse's Statior	3	Nurses	8	Suggested to me
46	5/09/2014	68yo M post ileostomy	4	Surgery (i	3	Professional Identit	37	How to work more effic	3	Nurse's Statior	5	Peers (Doctors)	32	Watching Peer
46	5/09/2014	68yo M post ileostomy	4	Surgery (i	3	Professional Identit	37	How to work more effic	3	Nurse's Statior	6	Application of previous knowled	27	Personal experience
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	2	Administration	20	How to organize suppo	3	Nurse's Statior	1	Consultant	4	Feedback from them
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	2	Administration	25	Where to find forms/pa	3	Nurse's Statior	1	Consultant	1	Watching them
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	2	Administration	60	How to manage time b	10	Other	6	Application of previous knowled	23	Hospital education session
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	2	Administration	64	How to communicate v	10	Other	6	Application of previous knowled	27	Personal experience
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	2	Administration	66	Who the appropriate p	3	Nurse's Statior	1	Consultant	3	Telling me
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	1	Content	1	Patient's History	1	Bedside	1	Consultant	1	Watching them
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	1	Content	1	Patient's History	1	Bedside	7	Patient and/or Patient's Family	28	Answer to my question/s
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	1	Content	1	Patient's History	1	Bedside	7	Patient and/or Patient's Family	30	Patient's notes / charts
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	1	Content	2	How to examine patier	1	Bedside	1	Consultant	1	Watching them
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	1	Content	8	Medication dosage	8	Corridor	1	Consultant	2	Listening to them
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	1	Content	13	Clinical knowledge	10	Other	1	Consultant	2	Listening to them
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	3	Professional Identit	4	What to say to sound p	10	Other	6	Application of previous knowled	27	Personal experience
73	10/09/2014	Pyelonephritis in an elderly g	4	ED	3	Professional Identit	37	How to work more effic	10	Other	6	Application of previous knowled	27	Personal experience

APPENDIX 25 – EXAMPLE OF JOURNAL .CSV FILE DATA

	A	B	C	D	E
72	20	FStephen28	40	24/01/2013 0:00	This case was interesting because we were not able to come to a definite diagnosis, although we think we have taken the appropriate steps to help the pt in the long term. I was frustrated with the constraints on medical imaging. We would like to order a test the hospital doesn't provide but we also want to get it financed by the hospital, however nobody seems to know which tests are covered and how to find out and how to organize them. I spoke to multiple people and am still without an answer. I feel like the processes in the hospital are deliberately difficult and sometimes feel as though these could be streamlined. Form after form and phone call after phone call just takes so much time out of the day.
73	20	FStephen28	53	25/01/2013 0:00	In this case, I had to contact home IV - who weren't very helpful. We also had to liaise with our team and infectious diseases which was frustrating when they only gave verbal orders and did not provide a written plan. This patient was also DVA so getting authority for scripts was new task. Something that we don't really get taught in orientation week.
74	20	FStephen28	55	26/01/2013 0:00	This patient was interesting. She was the first patient i've admitted to the medical team from the emergency department. I knew she was very unwell as did the registrar so we asked the night reg to check on her. She had a met call at 7.30 am and was subsequently transferred to ICU.
75	20	FStephen28	56	30/01/2013 0:00	This was a very sad case. My first admission and sadly she died. I felt somehow responsible even though I know I'm really not. She had been in ICU for almost four days. Her blood cultures took three days to return and that was melioid positive, which I now know has a 50% mortality rate once grown on culture. It demonstrated that even though we can isolate causative organisms, it doesn't matter in some cases. It is unfortunate that the cultures took that long to grow. Had we known earlier perhaps a treatment could have been administered. Tropical infectious diseases can present in many different ways, so it is hard to know when to prescribe high level antimicrobials and when to not.
76	20	FStephen28	73	15/04/2013 0:00	First day and was asked to help out theatre. It was great. Everyone was helpful and friendly.
77	20	FStephen28	74	16/04/2013 0:00	This case is tough for me because the patient is a young girl who was involved in a terrible accident while doing something really thoughtless. It's sad because she will live with lifelong issues due to her injuries. It's also hard because her care is costing the health system so much and it's all the result of something illegal and somewhat self inflicted.
78	20	FStephen28	76	17/04/2013 0:00	This was a great opportunity as I first met this patient on my medical rotation. I have now been involved in both his medical and surgical care.
79	20	FStephen28	130	18/04/2013 0:00	This case was interesting because I was able to actively participate in this individual's treatment. I was able to gain new skills thanks to a registrar who was keen to teach.
80	20	FStephen28	147	19/04/2013 0:00	This case was a great case to be involved with. I was able to help in multiple wound reviews and also was able to check the patients progress independently.
81	20	FStephen28	148	2/07/2013 0:00	This was a good case to be involved in as I haven't done any sexual health counselling. I was nervous, but my GP supervisor was great and it was a great learning experience for both myself and the patient!

Queensland Government

JAMES COOK UNIVERSITY AUSTRALIA

Interns' Learning in the 21st Century

Information Sheet for Supervisors of Interns

The current Australian medical internship is undertaken using an 'apprenticeship model' of teaching and learning. However the apprenticeship model of learning is ill-defined, especially in Australian hospital settings. You are invited to take part in a research project about the 'apprenticeship model' of teaching and learning for interns in Australia. The study is essentially trying to define what and how interns learn in modern clinical environments.

This study will inform providers of medical education and contribute towards best evidence medical education that will be used for benchmarking. It will also contribute towards a Doctor of Philosophy study being conducted under the supervision of the School of Medicine and Dentistry at James Cook University.

Your participation in this study will involve;

- Participating in semi-structured interviews (1 – 2 interviews @ approximately 20 – 30 minutes). These semi-structured interviews will explore your understanding of the concept of 'apprenticeship' learning for interns in Australia and your perceptions of what your 'apprentice' interns have learnt during the first week of each term.

As I am the Principal Researcher, I will be conducting this study, including the interviews. Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice. You may also withdraw any unprocessed data from the study.

The complete findings of this study will be made available to you once the thesis has been accepted by the School of Medicine and Dentistry at James Cook University some time in 2017. Parts of this study may be published in peer-reviewed journals prior to this. Please contact me or my Supervisor if you require any additional information.

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If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811
Phone: (07) 4781 5011 (ethics@jcu.edu.au)

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